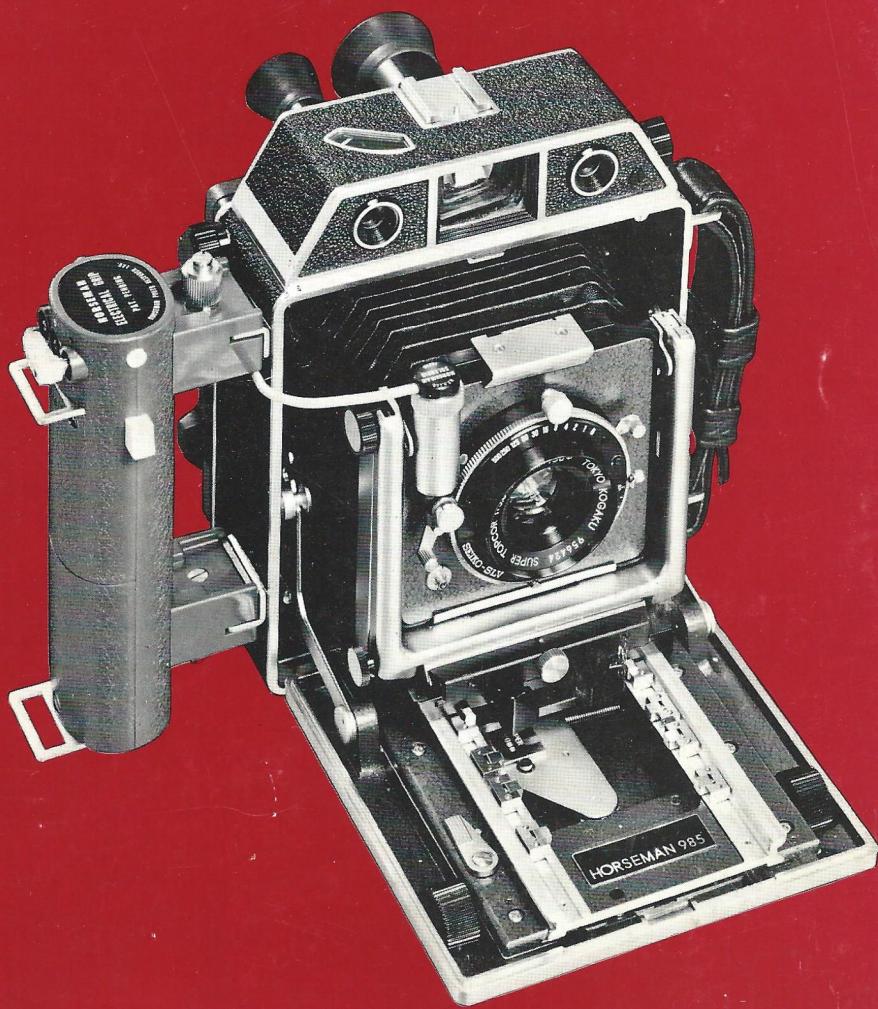


HORSEMAN®  
OWNER MANUAL



## A HISTORY OF THE HORSEMAN 985: THE PORTABLE, MULTIFORMAT AND TECHNICAL CAMERA HORSEMAN 985

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In general a versatile technical camera for the professional photographer is either an assembled systems studio camera or a folding (collapsible) field type bellows camera both of which were widely used in past years.

Studio cameras of the folding type were the earliest made. They were very convenient to use and easy to manufacture. Although these view type cameras were perfected, very little actual improvements were made. View cameras of today are direct descendants of the early studio cameras.

At present only the larger format studio cameras, not the smaller ones, are being widely used as professional and business cameras.

On looking over this history of the camera in Japan, before or after World War I (1900-1910) the nature of the studio camera differed greatly from the many amateur type cameras exported. Recent (1930-40) developments in the sensitivity of materials, optical lenses and precision machinery industry have made cameras smaller and more powerful whether they be for professional or amateur use.

Especially rapid developments of high power and large diameter lenses made the cameras of the non-professional smaller and more useful.

Various mechanical and technical problems that made cameras inconvenient in use were resolved technically on both optical and mechanical parts. Wonderful developments were made in small cameras.

After World War II, Japan became one of the leading camera industries of the world, standing on the base of techniques for making optical glass, developed during the War in Japan. These improvements were accelerated by the growing photographic interest within Japan, plus the added purchasing power of foreign countries for the cameras made by Japanese companies.

However, even in countries noted for their camera industries, most of the production was in small size cameras which are only suited to mass production and mass selling. The professional, versatile technical cameras of multi formats were not suited to mass production and remained unchanged. The reasons why are many.

Differences existed in the mechanical requirements between the cameras of multi-format, the versatile technical cameras and amateur camera requirements. The principal aim of the non-professional camera is in snapshots where a straight line passing through the center of the film vertically and the optical axis in the center are the same.

The professional technical camera requires the same conditions but the necessary change of relationships between the center of the picture and the optical axis must be able to change at any time when required and return precisely again to aligned position.

Thus, the big difficulty of manufacturing was the demand that professional cameras be made in very small quantities compared to the non-professional camera. Much difficulty was required to achieve such production.

Since 1952, a big change occurred in the camera business circle as the color picture age had arrived.

At this time, the general professional photographers were still accustomed to use the studio view as the easiest. Industrialists were chasing an immediate profit only and devoted themselves to mass production and mass sales. Thus the development of modern multiformat cameras in Japan was stationary, I think.

Therefore, the professional advanced photographer, who awakened to the new age was compelled to use non-professional cameras. As there were no cameras made for their needs, they suffered from much inconvenience.

I was one of the professional camera users, and had felt the necessity of a multi format, technical camera in place of the old age studio camera; a high precision, a modern camera. I dreamed of the realization of such an idea for a long time.

In 1946, which was called the twilight of the camera industry, it was determined that we begin the business of developing the modern, versatile technical camera, an idea of mine for a long time.

In 1948, the first trial camera of versatile, technical 6x9 cm size was produced. Thereafter, my enthusiastic endeavors for production of more developed cameras was continued.

In 1958, after having had many turns and twists we gained the cooperation of Tokyo Optical Co., Ltd., one of the very famous manufacturers of the photographic precision equipment in Japan, in the matter of design, manufacturing and sales of the multiformat, technical cameras. We then entered into forward growth practically and seriously.

In 1959, the Model 104 was completed and introduced on trial. My many experiences were then utilized to further perfect my ideas.

In 1960, I introduced the Model 960 into the markets for the first time.

Thenceforth, in 1963, the Model 970, more improved than the Model 960 was introduced and in 1965 the Model 760 which does not use a rangefinder, was introduced. Under such a consistent flow of ideas and design many important improvements were made.

In 1968, the Model 980 was the result of this constant improvement. It was the Model 980 which we introduced at the 10th Photokina in West Germany, held in Koln in October, of 1970.

The Horseman 985 is a multiformat technical camera that is a modified companion version of the earlier Horseman 980. This new 985 has a cross front, left and right, of 30 mm, as against 14 mm on the 980. In model 985, the left-right cross front is possible up to 20 mm at infinity position even with the use of wide angle lens.

Fortunately, we achieved our desire which we had worked for a long time, a reputation that the Horseman camera is the most superlative camera among the multi format, technical camera in the world.

We would like to recommend you our Model 985 camera with a great confidence.

The fact that we could continue to study and maintain such a special business for a long time was gained by the result of heartily co-operation of the Tokyo Optical Co., Ltd. and our users' and dealers' and agents' warm understandings, for which we appreciate it very much.



KOMAMURA PHOTOGRAPHIC CO., LTD.  
Masaji Komamura,  
President

## Komamura Photographic Co., Ltd.

MANUFACTURERS & EXPORTERS  
8. 2-CHOME, TAKARACHO, CHUO-KU.  
TOKYO, JAPAN  
CABLE ADDRESS:  
HORSEMANPHOTO TOKYO  
PHONE: 562-0531 3  
567-3605

## Specification

1.) **Type :** 6x9cm. and 6x7cm., Technical camera.

2.) **Picture size :**  
 Nominal: 6 x 9 cm. 6 x 7 cm.  
 Actual: 5.6 x 8.2 cm. Roll Film 5.6 x 7.0 cm.  
 5.8 x 8.2 cm. Plate & Cut Film. 5.8 x 7.0 cm.

3.) **Films :** Sheet film  
 No. 120 film, No. 220 film;

4.) **Dimension & Weight:**  
 Dimension (outside): H: 17.5cm. W: 15.9cm., D: 9.0cm.  
 Weight: 2 Kgs. (Body only)

5.) **Rangefinder :**  
 Type: Double-image coincidence type.  
 Coupling system: Cam-Coupling  
 Coupling Range: 65mm, 75mm., 90cm., 105mm .....inf.-1m.  
 120mm, 150mm, 180mm., .....inf.-2m.

6.) **Focusing:**  
 Focusing by use of coupled-rangefinder;  
 Focusing by the manual setting of distance scale;  
 Focusing by groundglass.

7.) **Finder :**  
 Universal, Brilliant Type,  
 Polyfocus Optical Viewfinder:  
 Field of View: The field of View is indicated in the bright frame viewfinder for the 90mm., 105mm., 150mm. & 180mm., lenses.  
 The ratio of the field of view to the area covered is as follows; (at infinity)  
 a) 65mm. lens ..... 85%  
 75mm. lens ..... 100%  
 120mm. lens ..... 80%  
 (outer frame of 150 mm)  
 b) Others lenses ..... 90%  
 Parallax Correction:  
 For 90mm., 105mm, 120mm., 150mm., & 180mm.,  
 the Parallax correction will be done automatically.

8.) **Bed :**  
 Opening & Closing: Opens to 90° and 105°(Bed Down) by the Braces.  
 Extension: 7.2 cm.  
 Infinity Stops: All HORSEMAN lenses must be accompanied with its own individual Cam in order to properly couple it to the automatic rangefinder, and the corresponding set of infinity Stops are prepared on the rail and colour coded.

9.) **Camera Movements :**  
 Bed: 15° Down  
 Lens-Standard: Rising ..... 28mm.  
 Swing ..... 15° L/R  
 Tilt ..... 10° Forwards  
 ..... 15° Backwards  
 Cross ..... 30mm. L/R  
 Back: Extension ..... 23mm.  
 Tilt ..... 11° up/down  
 Swing ..... 10° L/R

#### 10.) **Lens-Mount:**

All lenses should be mounted in the HORSEMAN 4-Way Lensboard which is exclusively prepared.

#### 11.) **Lenses :**

Standard lens:

Professional HORSEMAN 105mm, F:3.5

3 Components 4 Elements;

View angle 51° 12.5cm  $\phi$

Super HORSEMAN 90mm, F:5.6

4 Components 6 Elements;

View angle 58° 15.0cm  $\phi$

Super HORSEMAN 105mm, F:4.5

4 Components 6 Elements;

View angle 51° 1.58cm  $\phi$

Super HORSEMAN 120mm, F:5.6

4 Components 6 Elements;

View angle 45° 16.0cm  $\phi$

Wide Angle:

Professional HORSEMAN 75mm, F:5.6

4 Components 6 Elements;

View angle 68° 12.0cm  $\phi$

Super HORSEMAN 65mm, F:7.0

4 Components 6 Elements;

View angle 76° 14.8cm  $\phi$

Telephoto lens:

HORSEMAN 180mm, F:5.6

4 Components 4 Elements,

View angle 32° 14.0cm  $\phi$

Long Focal length  
lens:

Super HORSEMAN 150mm, F:5.6

3 Components 4 Elements,

View angle 37° 16.0cm  $\phi$

#### 12.) **SHUTTER New Seikosha SLV #0**

Shutter Speed: B, 1, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500. Sec.

Synchronization: M, X switch

Self Timer: Built-in V.

Pre-focus Lever: Built-in

#### 13.) **SPECIAL INSTALLATION**

Accessory Shoe: Put-in type (J.I.S.)

Flash unit attachment: Available with Exclusive Heavy Duty Gun Clamp

Tripod Socket: Screw-in type for U3/8", U1/4"

#### 14.) **ACCESSORIES**

HORSEMAN Roll Film Holder Model 1, 6x9cm, 8 pictures on 120 roll film

HORSEMAN Roll Film Holder Model 2, 6x7cm, 10 pictures on 120 roll film

HORSEMAN Sheet film holder, single

HORSEMAN Optical Exposure Computer

HORSEMAN Lens shades

HORSEMAN Special Cable Release

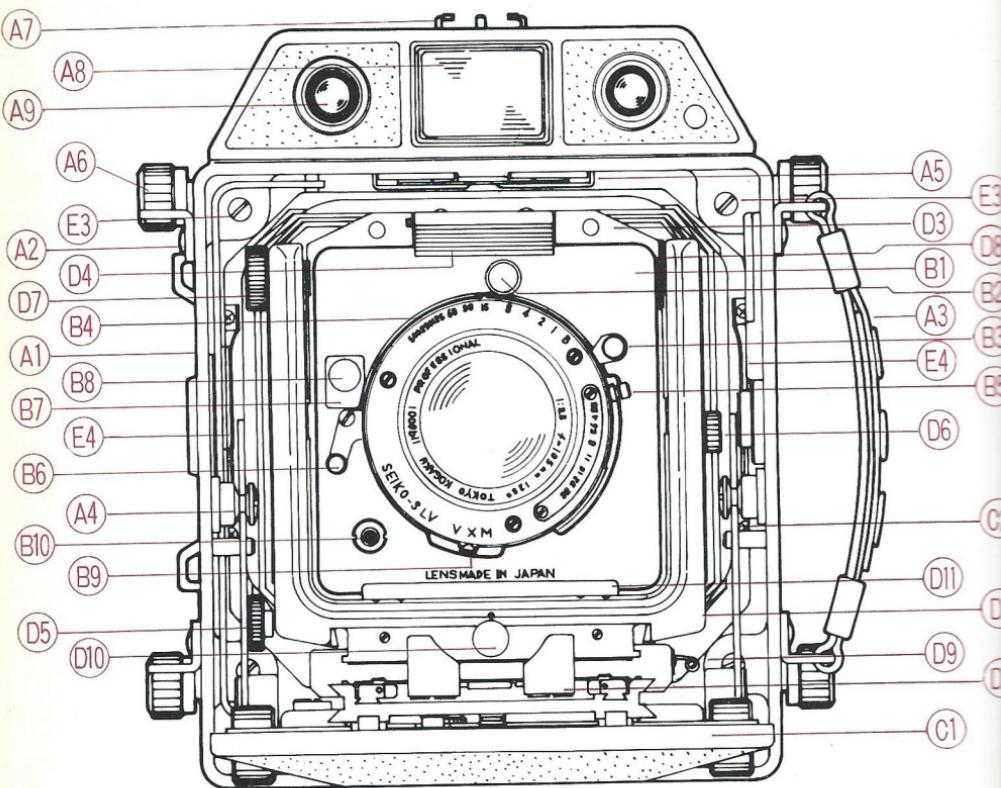
HORSEMAN Lensboard

HORSEMAN Coupling Cams

HORSEMAN Carrying set case

HORSEMAN Heavy duty gun clamp

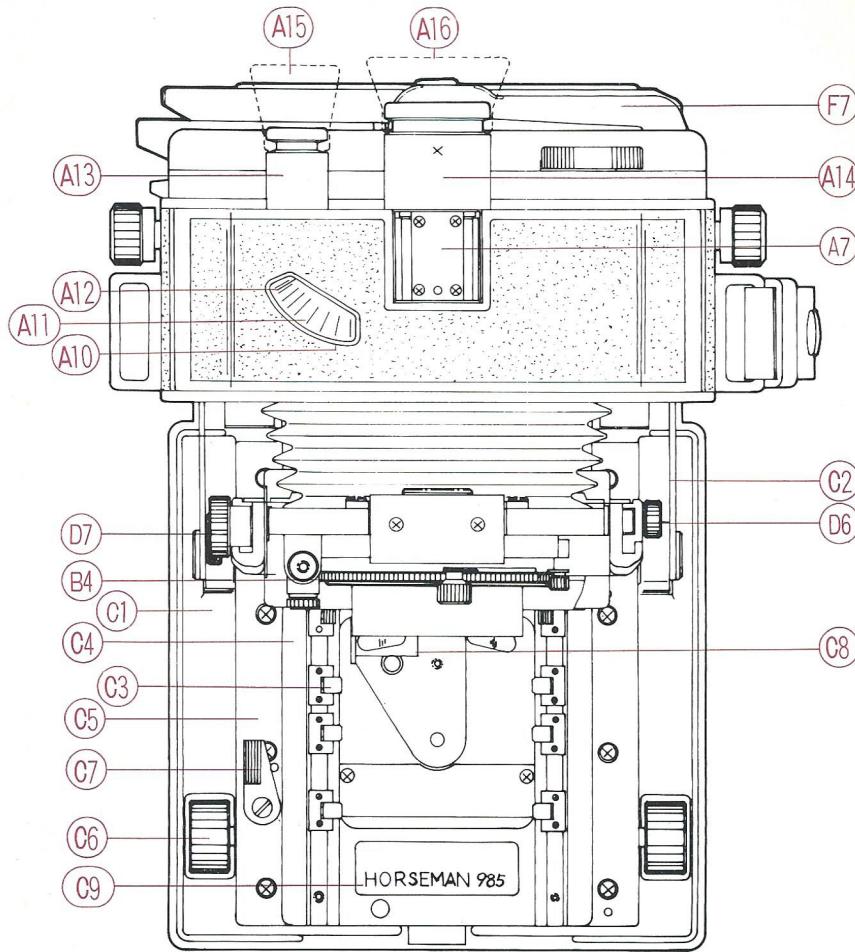
HORSEMAN Electrical Grip w/electrical release and Wire remote control switch



### A. CAMERA BODY

- (A1) Body
- (A2) Flashgum Bracket
- (A3) Carrying Strap Car
- (A4) Vertical Retaining Screw
- (A5) Cam Storage Slots
- (A6) Swing Back Locking Knob
- (A7) Cable Release Catch
- (A8) Optical Viewfinder
- (A9) Rangefinder Front lens

- (A10) Distance Scale Cover Glass
- (A11) Distance Scale
- (A12) Distance Scale Indicator
- (A13) Rangefinder Eye Piece
- (A14) Viewfinder Eye Piece
- (A15) Rangefinder Rubber Shade
- (A16) Viewfinder Rubber Shade



- (B1) Lens Board
- (B2) Shutter Set Lever
- (B3) Focus Lever
- (B4) Shutter Speed Ring
- (B5) Aperture Indicator
- (B6) Shutter Release Lever
- (B7) Cable Release Socket
- (B8) Locking Screw For Cable Release
- (B9) Flash Synchronization Lever
- (B10) Flash Cable Socket

- (C1) Camera Bed
- (C2) Bed Braces
- (C3) Infinity Stops
- (C4) Focusing Track
- (C5) Rail Guide
- (C6) Focusing Knob.
- (C7) Focusing Lock
- (C8) Coupling Cam
- (C9) Identification Plate

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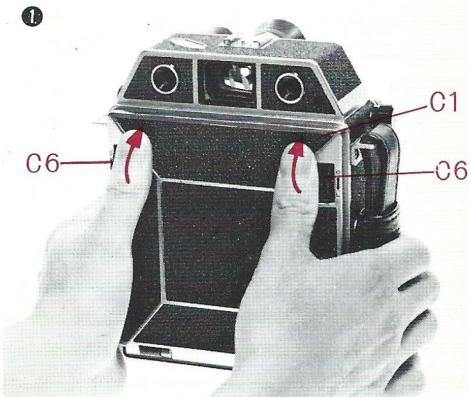
# 3

## Before and After picture taking:

### \* Opening the Camera

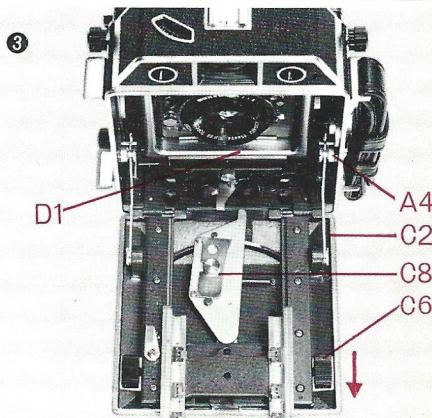
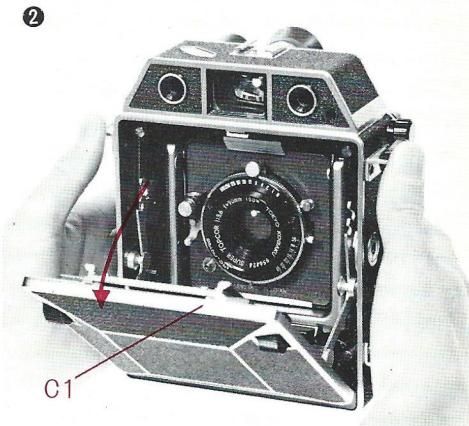
(1) Rotate the Focusing Knob (C6) to the → O direction, and the Bed (C1) will open slightly.

photo ..... 1



(2) Pull the bed open slowly until the Bed Braces (C2) snap into position. Make certain that both Bed Braces have snapped into their locked position. Remember that the first position is 90° and the second position opens the Bed to 105°

photo ..... 3



#### \* Pulling out the Lens Standard

The following procedure should be followed:

(1) Make certain the correct Coupling Cam (C8) is in place may be checked, removed or replaced by turning the Focusing Knob (C6) which will expose the Coupling Cam. All lenses and Coupling Cams are colour coded. Make certain that the colour on the lens, the imprint "Lens Made in Japan", and the colour of the imprint on the Coupling Cam (C8) match.

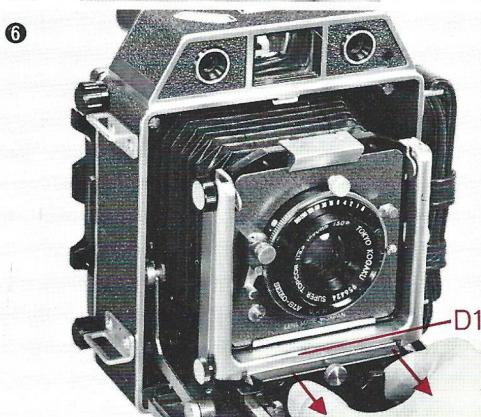
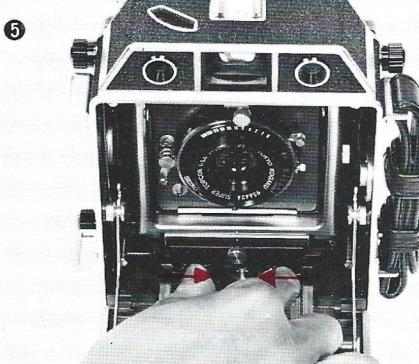
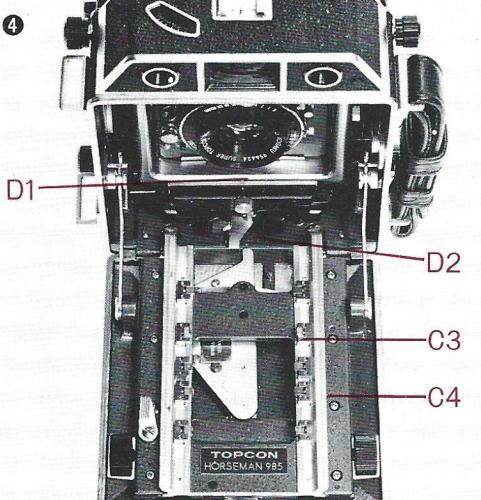
(2) After making certain that the proper Coupling Cam is in place return the rail to its original position. This is very important since if it is not done the Lens Standard (D1) will not be properly aligned to slide onto the rail.

(3) After returning the rail to its original position raise the correct pair of Infinity Stops (C3). Again these will be colour coded to match the correct Lens and Coupling Cam.

(4) Grasp firmly and squeeze together the Pull-Out-Grips (D2). Pull Lens Standard onto the Focusing Track (C4). This will be accomplished smoothly if the Focusing Track has been fully returned to its original position after check the Coupling Cam.

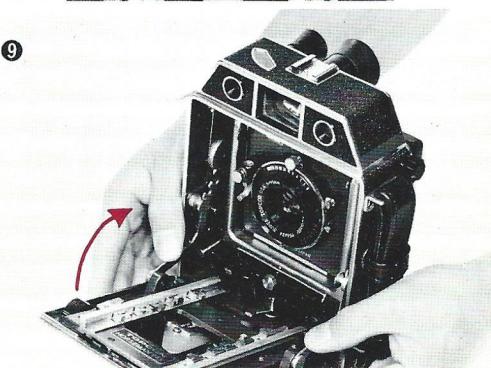
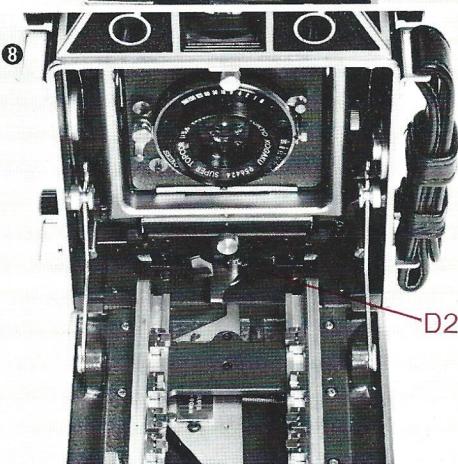
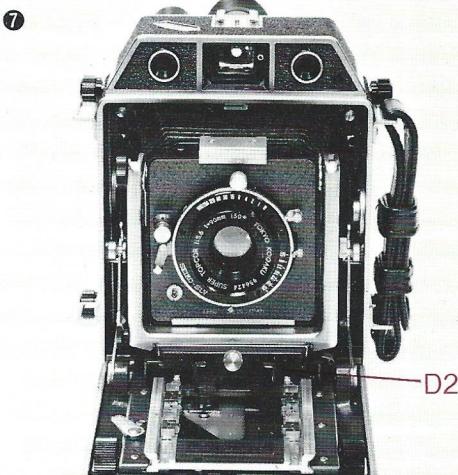
(5) While grasping the Pull-Out-Grips (D2) firmly pull the Lens Standard all the way out until it stops against the correct pair of Infinity Stops (C3) to assure proper coupling with the rangefinder.

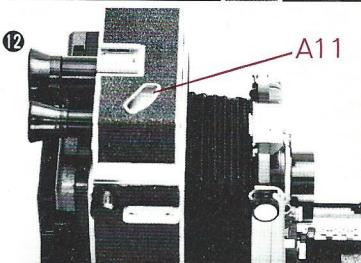
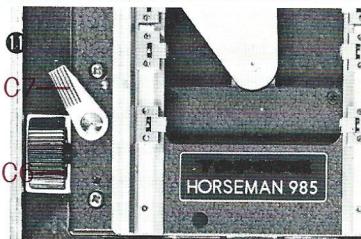
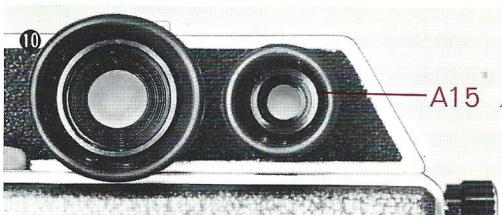
(6) When you release the Pull-Out-Grips the Lens Standard will be firmly locked in position.



\* **Closing the Camera**

- (1) Return the Focusing Track to its original, fully retracted, position.
- (2) Grasp firmly and press together the Pull-Out-Grips (D2). Push the Lens Standard back into the body of the camera all the way. Care should be exercised here to make certain that the Lens Standard is completely returned to its storage position. If it is not the Camera Bed (C1) will not close and the focusing rail may result. You may confirm whether or not Lens Standard is completely retracted by the Red Pointer (A12) on the distance scale. When this Red Pointer (A12) is no longer visible in the distance scale window the Lens Standard is fully retracted into its storage position.
- (3) Grasp the camera body with both hands, with the camera facing from you, and place your thumbs on the Bed Braces (C2) which will release the Bed and allow you to close the camera completely.  
Then rotate the Focusing Knob (C6) to the (→ L) direction.





Focusing on the HORSEMAN 985 is accomplished by following methods:

- (1) Focusing by use of coupled rangefinder.
- (2) Focusing by the manual setting of the distance scale.
- (3) Focusing by groundglass.

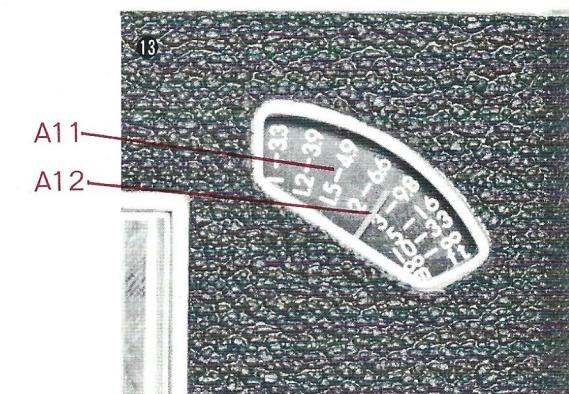
\* **Rangefinder**

- (1) The lens is automatically coupled to the rangefinder by the Coupling Cam.
- (2) Place your eye behind the rangefinder eye piece and center your subject in the rangefinder.
- (3) The rangefinder of the HORSEMAN 985 is of the double-image coincidence type. Turn the Focusing Knob (C6) slowly until there is only one sharp image in the rangefinder.
- (4) After the image has been focused you may lock the Focusing Track (C4) in position by pushing the Track Locking Lever (C7) out and forward. This will prevent accidental movement or jarring of the focusing track during exposure.
- (5) The distance from the film plane to the image may be read on the Automatic Distance Scale (A11) in the top of the Camera housing.
- (6) Since the Rangefinder's magnification is 1:1 it is unnecessary to close the other eye. Due to the large eyepiece you also will find it unnecessary to hold your eye tight against the finder window. This will cause no error in your rangefinder adjustment.
- (7) The recommended coupling range of the rangefinder is also as follows:  
Lens Focal Length.  
6.5, 9.0, & 10.5cm. Infinity-1m, (3.3 feet)  
12.0, 15.0, & 18.0cm. Infinity-2m. (6.6 feet)  
Any distances less than above recommended minimums should not be due to coupling inaccuracies.
- (8) In actual focusing there will be no error whether the image moves from left to right or right to left. This is due to the extreme precision with which this camera is manufactured.

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#### \* Manual Focusing

- (1) Manual focusing may be accomplished by making a visual estimate and then turning the Focusing Knob until the pointer shows this distance on the distance scale.
- (2) The distance may also be taken by means and then the pointer placed at the correct reading on the distance scale by moving the focusing Knob.
- (3) When focusing is completed pull out Track Locking Lever (C7) to avoid accidental movement or jarring during exposure.
- (4) Automatic Distance Scale. Check the operation of the pointer on the automatic distance scale as follows:
  - a) When the Lens Standard is pulled out on the rail and the rail track is in its original fully retracted position the pointer on the automatic distance scale must read infinity.
  - b) Please note that there are two engraved distance scale. One of the scales is for meters and other is for feet.



## Ground-glass Focusing

In order to  
Open the shutter



Blades fully.  
(Set the Diaphragm lever at  
its largest opening.)

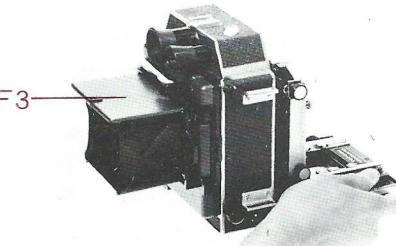
Cock the shutter by  
Set Lever (B2)



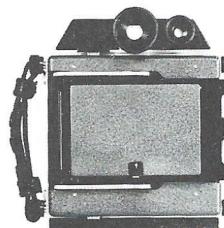
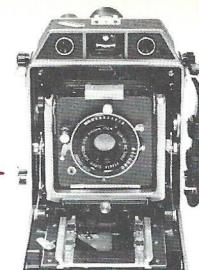
Pull out the Focus  
Lever (B3), and the  
shutter Blades will  
be opened fully.



shutter blades  
opens fully

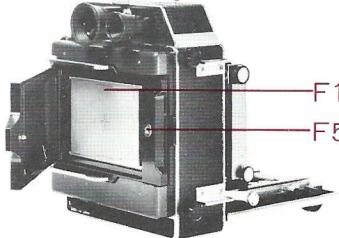
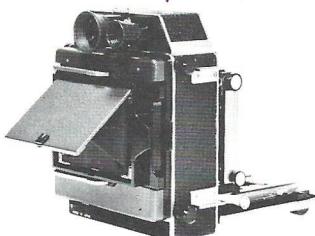


Turn the Focusing Knob (C6) until the  
sharpest image is obtained on the Ground  
glass, and lock the rail by Locking Lever  
(C7).



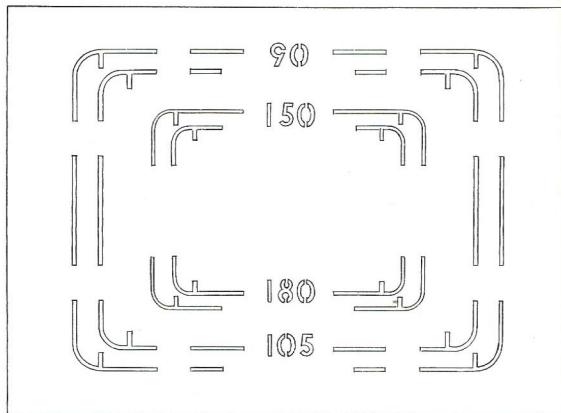
Focusing-Hood

magnifier



Ground glass opens

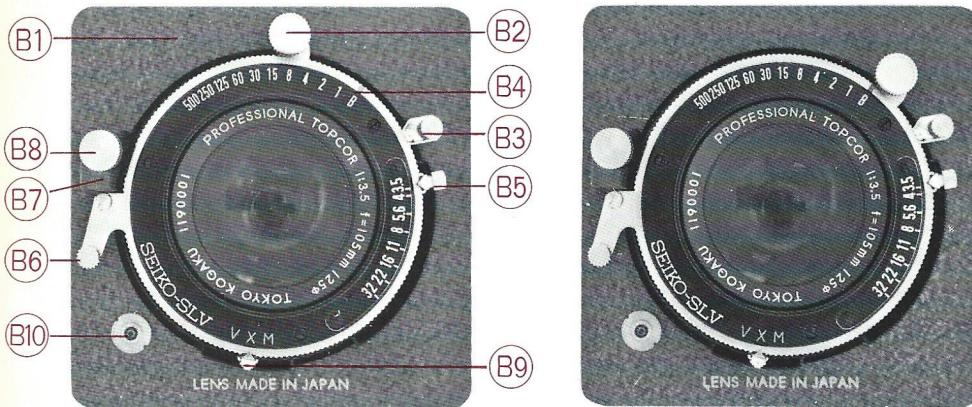
Owing to use of Fresnel lens, the image  
on the Glass is fully clear. When the  
magnifier is used, use the image in the  
circle only which has no visibility for  
focusing.



- (1) Locate your subject with one eye through eyepiece of the Viewfinder.
- (2) Determine the correct frame to be used according to the focal length of the lens in the camera.
  - a) 65mm & 75mm lenses use the full frame of the Viewfinder.
  - b) 90mm, 105mm, 120mm, 150mm, & 180mm lenses select the corresponding frame.
- (3) The ratio of the field of view to the area covered is as follows;  
 (At Infinity)
 

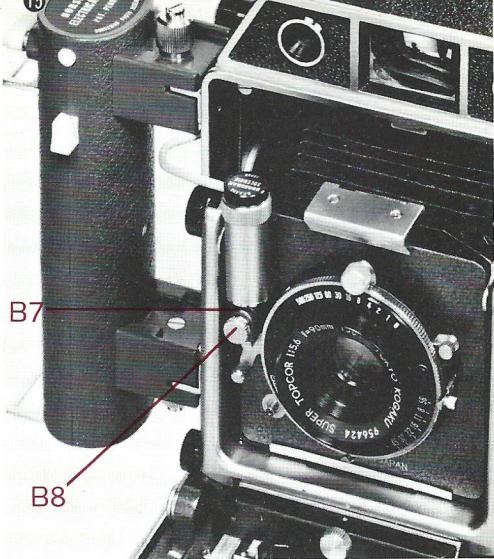
a) 65mm lens	85%	b) 75mm lens	100%
c) Other lenses	90%	d) 120mm lens	80%

 If you need much precise area covered within 2m., use groundglass back.
- (4) The field of view is indicated in the bright frame viewfinder for the 90mm, 105mm, 150mm, & 180mm. lenses.



The shutter of the HORSEMAN lenses is synchronized by setting the M-X lever on the lower side of the shutter ring.

- (1) Select the desired shutter speed by turning the Shutter Speed Ring (B4) until the red mark is above the speed selected.
- (2) Cock the shutter by pressing the Cocking Lever (B2) from left to right. You will notice a resistance but press all the way toward the right until the cocking stops.
- (3) To release the Shutter for an exposure press the Shutter Release Lever (B6).
- (4) The shutter may also be released with the use of a Shutter Release Cable or the Electrical magnetic Shutter release (refer to accessory list). Place the Shutter Release Cable in Cable Release Holder (B7) and tighten the Cable Release Locking Screw (B8). Slide the plunger end of the Cable Release Shoe (A7). Either the right or left Cable Release Shoe may be used as preferred. This will provide a Body Shutter Release.
- (5) The following precautions should be observed:
  - a) Do not allow the shutter to remain cocked when not in use.
  - b) Press Focus Lever (B3) must be closed before pressing the Shutter Release Lever (B6). Damage may result if this procedure is not followed.
  - c) When using the slow shutter speed such as 1 and 1/2 sec, be careful not to touch the Shutter Cocking Lever (B2) once the Shutter Release Lever (B6) has been pressed.
  - d) Do not press the Shutter Release Lever (B6) at the same time the Shutter Cock-Lever (B2) is being pressed.
  - e) The Press Focus Lever (B3) will not pull until the shutter has been cocked. Remember do not press the Shutter Release Lever (B6) until the Press Focus Lever (B3) has been pushed in.

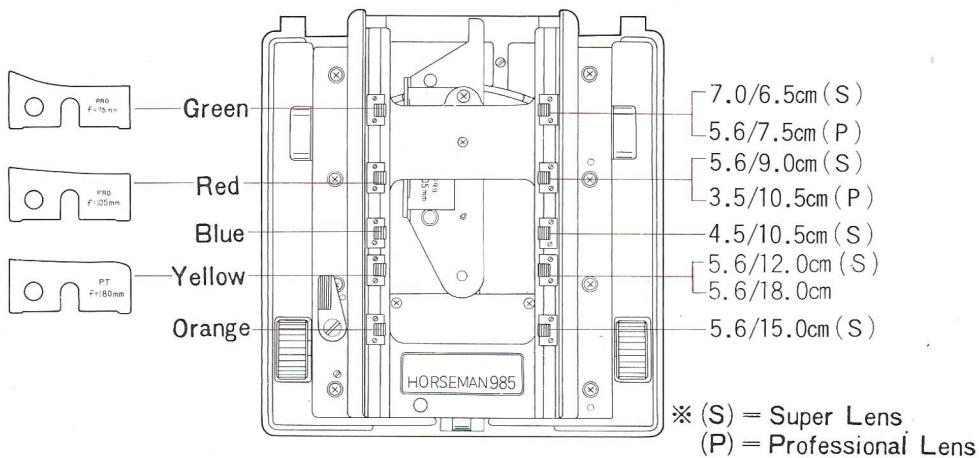


## G. FLASH SYNCHRONIZATION

The Seikosha Micromatic SLV #0 shutter used in the HORSEMAN LENSES is synchronized for most of the flashbulbs on the market and also for electronic flash. The shutter's maximum opening coincides with the peak illumination point of the flash source.

- (1) Select the desired setting by moving the M.X.V. Setting Knob (B9) until it points so the setting required:
  - a) M - is for flashbulbs
  - b) X - is for electronic units
  - c) V - self-timer with approximately 8 sec. delay.
- (2) The shutter is synchronized at all shutter speeds.
- (3) The following is a reference table of the relationship between M and X synchronization:
- (4) Insert the flash synchronization cord into the Synchronized Socket (B10) located in the lower left corner of the lens board.
- (5) When the M.X.V. Setting Knob (B9) is placed the V position the self-timer may be used, also in the V position the X synchronization (electronic flash) remains fully synchronized.
- (6) The heavy duty flash-gun clamps on the sides of the HORSEMAN 985 may be utilized for all makes of flash units on the market. Brackets are located on both sides of the HORSEMAN 985 camera body.
- (7) A special pair of heavy-duty clamps are available from the manufacturer for large flash gun units. Smaller flash units may be mounted in the accessory shoe located on the top of the camera housing. In the event the cord of the synchronization is too short the HORSEMAN 4-way Lens Board may be turned in such a manner as to place the M.X.V. Setting Knob (B10) in a position closer to the flash unit.
- (8)

	Class M.	Class F.	Electronic Flash
M.	Fully sync.	No sync.	No sync.
X.	1-1/30 sec sync.	1-1/100 sync.	Fully sync.



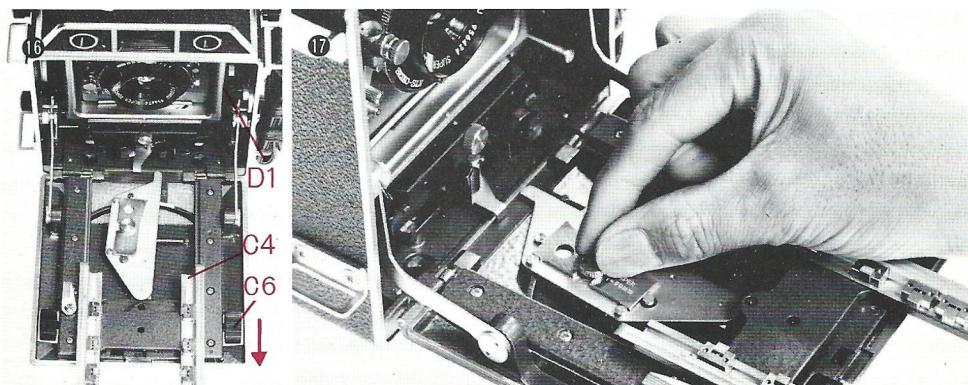
In order to couple to the camera rangefinder, lens, coupling Cam and Infinity Stops must be used in a Set.

All lenses may be changed very easily with little effort. Each lens must be accompanied with its own individual Cam in order to properly couple it to the automatic rangefinder, and the corresponding set of infinity Stops must be raised.

The camera comes equipped with three cams. These Cams are engraved with the lens name and the focal length and are colour coded to match the correct lens.

They are for the 105mm, F:3.5, 75mm, F:5.6, and 180mm, F:5.6 lenses. Two of the cams are stored in the Cam Storage slot (A5). There are five pairs of Infinity Stops on the rail of the camera body.

- (1) Select the desired lenses to be used.
- (2) Select the matching Cam for that lens by matching the colour coded. The Cam's focal length will be engraved in the correct colour and the lensboard engraving, "Lens Made in Japan" should be in a matching colour.



When another manufacturer's lens which is mounted in the HORSEMAN 4-Way lensboard is used with HORSEMAN camera at the infinity distance :

- (a) A general type lenses: .....Max. 18.0cm.
- (b) A telephoto type lenses: .....Max. 24.0cm.

To interchange Cams:

- a) Push the Lens Standard (D1) all the way into the body;
- b) Extend the focusing track (C4) by turning the Focusing Knob (C6), until the Cam in the Bed is completely exposed; Photo ..... (18)
- c) Loosen the Screw (photo 18) and slide out the Cam that is there; photo ..... (18)
- d) Slide the replacement Cam into position, the engraving marks up; push the lower part of the Cam in first, against the spring-tensioned guide post; Photo ..... (19) & (20)
- e) With the Cam snugly in position all the way in, tighten the locking screw.

When lenses are interchanged, the Cams must also be interchanged. Without its proper Cams placed, a lens will not work in coupled action with the rangefinder.

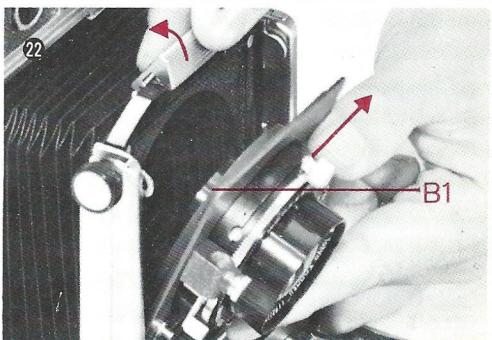
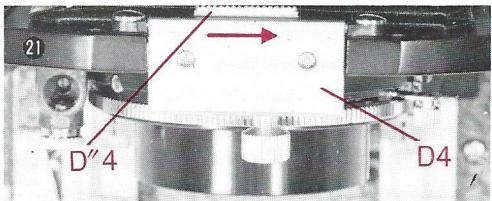
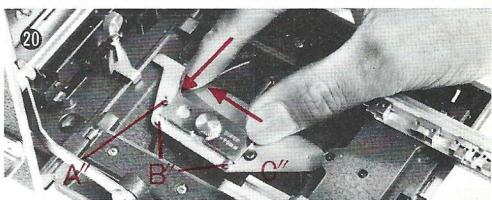
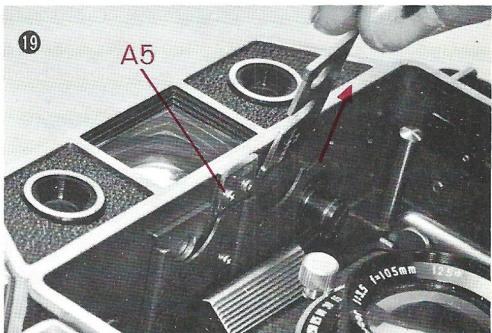
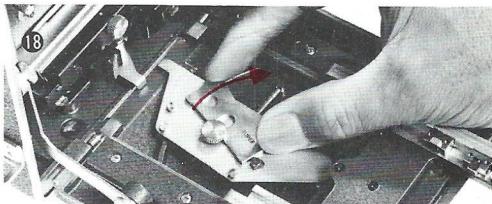
To interchange Lenses;

All lenses supplied with the HORSEMAN 985 are mounted on a HORSEMAN lensboard, in shutter. To put a lens into position on the camera, Set its lensboard (B1) into the channel across the bottom of the Front Standard; lift up the lensboard lock bar after thrusting the safety lock. (D'4)

And then set its lensboard upper part into the Lock Bar (D4).

To remove the lens from the camera, reverse the procedure Lift up the lock bar after thrusting the Safety lock and Pull the lens slightly out and up; now lift it out entirely.

The heavy-duty spring built into the lensboard lock bar of the HORSEMAN 985 assures a firm grip on the lensboard with even the heaviest lenses.



## 8

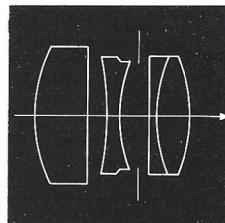
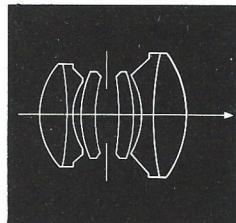
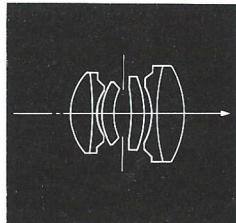
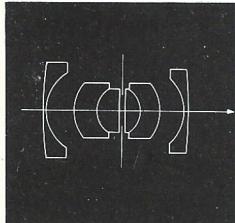
## Lens Specifications

The scale of 1/2.6

1/1.9

1/1.7

1/1.7



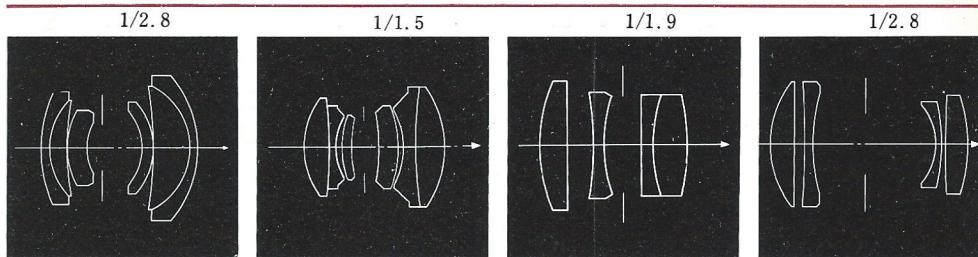
Super HORSEMAN  
wideangle Lens  
6.5cm F7

Professional  
HORSEMAN  
wideangle Lens  
7.5cm F5.6

Super HORSEMAN  
Standard Lens  
9.0cm F5.6

Professional  
HORSEMAN  
Standard Lens  
10.5cm F3.5

	Nominal Focal Length,	Maximum Aperture Ratio (F-Stops)	Lens Components and elements	Maximum angle of View	Image circle
Super HORSEMAN Wideangle lens,	6.5cm	1:7	4 : 6	76°	F 7 (120) 85° F22 (152) 99°
Professional HORSEMAN Wideangle lens,	7.5cm	1:5.6	4 : 6	68°	F5.6 (100) 68° F22 (120) 77°
Super HORSEMAN Standard lens,	9.0cm	1:5.6	4 : 6	58°	F5.6 (130) 72° F22 (150) 80°
Professional HORSEMAN Standard lens,	10.5cm	1:3.5	3 : 4	51°	F3.5 (100) 51° F22 (125) 61.5°
Super HORSEMAN Standard lens,	10.5cm	1:4.5	4 : 6	51°	F4.5 (128) 63° F22 (158) 70°
Super HORSEMAN Standard lens	12.0cm	1:5.6	4 : 6	45°	F5.6 (160) 64° F22 (160) 64°
Super HORSEMAN Long focal length lens	15.0cm	1:5.6	3 : 4	37°	F5.6 (140) 50° F22 (160) 53°
HORSEMAN telephoto	18.0cm	1:5.6	4 : 4	32°	F5.6 (100) 32° F22 (140) 42.5°



Super HORSEMAN  
Standard Lens  
10.5cm F 4.5

Super HORSEMAN  
Standard Lens  
12.0 cm F 5.6

Super HORSEMAN  
Long focal Length Lens  
15.0cm F 5.6

HORSEMAN  
18 Telephoto Lens  
18.0cm F 5.6

Shutter Speed	Diaphragms	Distance from lens seat to film plane at infinity Dis.	Coupling Range	Dia. of inside screw of Filter	Overall length (mm)	Weight (g)	Storage possibility to camera body
B. 1 ~ 1/500	7 ~ 45	70.3 ± 0.05	∞ ~ 1 m	40.5 φ ( P=0.5 )	55.8	280	Possible
"	5.6 ~ 32	70.3 ± 0.05	∞ ~ 1 m	40.5 φ ( P=0.5 )	37.5	200	Possible
"	5.6 ~ 45	92.6 ± 0.05	∞ ~ 1 m	40.5 φ ( P=0.5 )	39.5	200	Possible
"	3.5 ~ 32	92.6 ± 0.05	∞ ~ 1 m	40.5 φ ( P=0.5 )	38.2	240	Possible
"	4.5 ~ 32	110.3 ± 0.05	∞ ~ 1 m	52 φ ( P=0.75 ) 62 φ ( P=0.75 )	64.0	410	impossible
"	5.6 ~ 45	122.4 ± 0.05	∞ ~ 2 m	40.5 φ ( P=0.5 )	49.8	260	Possible
"	5.6 ~ 45	141.8 ± 0.05	∞ ~ 2 m	40.5 φ ( P=0.5 )	41.5	230	Possible
"	5.6 ~ 45	122.4 ± 0.05	∞ ~ 2 m	52 φ ( P=0.75 )	74.5	310	impossible

## Lenses and Depth of Field

To bring a focus on the subject is to obtain the sharpest possible image.

When the focusing is accomplished, there is some acceptable distance both in front and back of the subject for the sharpness. This zone is called the Depth of Field.

This Depth of Field increases as much as the aperture is closed or the focal length of the lens is smaller, and decreases in the opposite case.

By means of utilizing this principle, it will be possible to have a object focused sharply but its foreground and background are hazy, or in another case the photographers can preset a deep zone of sharpness and wait the subject to come into the zone to shoot or within more deepened zone it is possible to obtain the sharp image over the wide area before and back of subject.

In the case that the camera movement is used, the picture taking should be made at the proper diaphragm which is always determined by referencing the Depth of Field in order to correct a distortion of the image by utilizing various kinds of the camera mechanism. On the contrary, in like as Close-up photography when a sharp image is required to obtain at the outside of the Depth of Field it will be obtained the same effect as well as the depth of Field is deepened by utilizing the camera movements compensating the ability of the diaphragm.

The following table shows the Depth of Field Table for the various kinds of HORSEMAN lenses and these table are determined at the diameter of circle of least confusion is all 0.07mm.

### ● Super HORSEMAN 6.5cm 1 : 7

(m)

	F 7	F 8	F 11	F 16	F 22	F 32	F 45
∞	∞ ~ 8.59	∞ ~ 7.53	∞ ~ 5.52	∞ ~ 3.84	∞ ~ 2.83	∞ ~ 2.00	∞ ~ 1.46
100 m	∞ ~ 7.92	∞ ~ 7.02	∞ ~ 5.24	∞ ~ 3.70	∞ ~ 2.76	∞ ~ 1.96	∞ ~ 1.44
50 m	∞ ~ 7.19	∞ ~ 6.58	∞ ~ 5.00	∞ ~ 3.59	∞ ~ 2.70	∞ ~ 1.93	∞ ~ 1.43
30 m	∞ ~ 6.58	∞ ~ 6.06	∞ ~ 4.70	∞ ~ 3.43	∞ ~ 2.61	∞ ~ 1.89	∞ ~ 1.41
20 m	∞ ~ 5.95	∞ ~ 5.52	∞ ~ 4.37	∞ ~ 3.26	∞ ~ 2.51	∞ ~ 1.84	∞ ~ 1.38
15 m	∞ ~ 5.52	∞ ~ 5.07	∞ ~ 4.08	∞ ~ 3.10	∞ ~ 2.42	∞ ~ 1.78	∞ ~ 1.35
10 m	∞ ~ 4.68	∞ ~ 4.35	∞ ~ 3.61	∞ ~ 2.83	∞ ~ 2.25	∞ ~ 1.70	∞ ~ 1.30
8 m	126.00 ~ 4.20	∞ ~ 3.94	∞ ~ 3.32	∞ ~ 2.65	∞ ~ 2.14	∞ ~ 1.64	∞ ~ 1.27
5 m	11.80 ~ 3.22	14.60 ~ 3.06	57.00 ~ 2.68	∞ ~ 2.23	∞ ~ 1.87	∞ ~ 1.48	∞ ~ 1.18
3 m	4.50 ~ 2.27	4.85 ~ 2.19	6.37 ~ 2.00	13.60 ~ 1.74	∞ ~ 1.52	∞ ~ 1.26	∞ ~ 1.04
2 m	2.54 ~ 1.66	2.65 ~ 1.62	3.02 ~ 1.51	4.00 ~ 1.37	6.43 ~ 1.28	∞ ~ 1.06	∞ ~ 0.91
1.5 m	1.77 ~ 1.31	1.82 ~ 1.28	1.98 ~ 1.22	2.33 ~ 1.13	2.99 ~ 1.04	5.85 ~ 0.92	∞ ~ 0.80
1.2 m	1.36 ~ 1.08	1.39 ~ 1.06	1.47 ~ 1.02	1.65 ~ 0.96	1.94 ~ 0.89	2.79 ~ 0.81	6.99 ~ 0.72
1 m	1.11 ~ 0.92	1.12 ~ 0.91	1.17 ~ 0.88	1.27 ~ 0.83	1.43 ~ 0.79	1.82 ~ 0.72	2.90 ~ 0.66

### ● Professional HORSEMAN 7.5cm 1 : 5.6

(m)

	F 5.6	F 8	F 11	F 16	F 22	F 32
∞	∞ ~ 14.53	∞ ~ 10.22	∞ ~ 7.47	∞ ~ 5.18	∞ ~ 3.81	∞ ~ 2.67
100 m	∞ ~ 12.71	∞ ~ 9.29	∞ ~ 6.97	∞ ~ 4.94	∞ ~ 3.68	∞ ~ 2.60
50 m	∞ ~ 11.30	∞ ~ 8.51	∞ ~ 6.52	∞ ~ 4.72	∞ ~ 3.56	∞ ~ 2.54
30 m	∞ ~ 9.84	∞ ~ 7.66	∞ ~ 6.02	∞ ~ 4.45	∞ ~ 3.40	∞ ~ 2.47
20 m	∞ ~ 8.47	∞ ~ 6.81	∞ ~ 5.48	∞ ~ 4.15	∞ ~ 3.23	∞ ~ 2.38
15 m	∞ ~ 7.51	∞ ~ 6.18	∞ ~ 5.07	∞ ~ 3.91	∞ ~ 3.09	∞ ~ 2.30
10 m	31.94 ~ 5.98	70.15 ~ 5.11	∞ ~ 4.33	∞ ~ 3.47	∞ ~ 2.81	∞ ~ 2.14
8 m	17.64 ~ 5.21	37.05 ~ 4.54	∞ ~ 3.92	∞ ~ 3.20	∞ ~ 2.63	∞ ~ 2.04
5 m	7.52 ~ 3.76	9.64 ~ 3.41	14.96 ~ 3.05	219.97 ~ 2.60	∞ ~ 2.22	∞ ~ 1.79
3 m	3.73 ~ 2.52	4.17 ~ 2.36	4.89 ~ 2.19	6.95 ~ 1.95	14.29 ~ 1.74	∞ ~ 1.47
2 m	2.28 ~ 1.78	2.44 ~ 1.70	2.66 ~ 1.62	3.14 ~ 1.49	4.04 ~ 1.37	7.97 ~ 1.20
1.5 m	1.65 ~ 1.38	1.72 ~ 1.33	1.82 ~ 1.28	2.03 ~ 1.20	2.35 ~ 1.13	3.24 ~ 1.02
1.2 m	1.29 ~ 1.12	1.33 ~ 1.10	1.39 ~ 1.06	1.50 ~ 1.01	1.66 ~ 0.96	2.03 ~ 0.88
1 m	1.06 ~ 0.95	1.08 ~ 0.93	1.12 ~ 0.91	1.19 ~ 0.87	1.28 ~ 0.83	1.48 ~ 0.78

● Super HORSEMAN 9.0cm 1 : 5.6

(m)

	F 5.6	F 8	F 11	F 16	F 22	F 32	F 45
∞	∞ ~ 21.04	∞ ~ 14.78	∞ ~ 10.44	∞ ~ 7.48	∞ ~ 5.49	∞ ~ 3.83	∞ ~ 2.78
100 m	∞ ~ 17.40	∞ ~ 12.89	∞ ~ 9.76	∞ ~ 6.97	∞ ~ 5.21	∞ ~ 3.70	∞ ~ 2.71
50 m	∞ ~ 14.87	∞ ~ 11.46	∞ ~ 8.92	∞ ~ 6.54	∞ ~ 4.97	∞ ~ 3.58	∞ ~ 2.65
30 m	∞ ~ 12.43	∞ ~ 9.96	∞ ~ 8.00	∞ ~ 6.03	∞ ~ 4.68	∞ ~ 3.43	∞ ~ 2.57
20 m	425.48 ~ 10.42	∞ ~ 8.57	∞ ~ 7.08	∞ ~ 5.50	∞ ~ 4.36	∞ ~ 3.26	∞ ~ 2.47
15 m	52.37 ~ 8.82	∞ ~ 7.51	∞ ~ 6.34	∞ ~ 5.05	∞ ~ 4.07	∞ ~ 3.10	∞ ~ 2.38
10 m	18.88 ~ 6.84	30.73 ~ 6.03	146.72 ~ 5.26	∞ ~ 4.35	∞ ~ 3.61	∞ ~ 2.83	∞ ~ 2.22
8 m	12.79 ~ 5.85	17.27 ~ 5.25	30.96 ~ 4.66	∞ ~ 3.93	∞ ~ 3.32	∞ ~ 2.65	∞ ~ 2.12
5 m	6.48 ~ 4.08	7.44 ~ 3.70	9.14 ~ 3.48	14.88 ~ 3.07	63.87 ~ 2.69	∞ ~ 2.24	∞ ~ 1.85
3 m	3.46 ~ 2.66	3.70 ~ 2.53	4.06 ~ 2.40	4.86 ~ 2.20	6.40 ~ 2.01	13.97 ~ 1.75	∞ ~ 1.52
2 m	2.18 ~ 1.85	2.27 ~ 1.79	2.40 ~ 1.73	2.64 ~ 1.63	3.01 ~ 1.52	3.97 ~ 1.38	6.98 ~ 1.24
1.5 m	1.59 ~ 1.42	1.64 ~ 1.39	1.70 ~ 1.35	1.81 ~ 1.29	1.97 ~ 1.23	2.32 ~ 1.14	3.04 ~ 1.04
1.2 m	1.26 ~ 1.15	1.28 ~ 1.13	1.32 ~ 1.11	1.38 ~ 1.07	1.46 ~ 1.03	1.64 ~ 0.97	1.94 ~ 0.90
1 m	1.04 ~ 0.97	1.05 ~ 0.95	1.07 ~ 0.94	1.11 ~ 0.91	1.16 ~ 0.88	1.26 ~ 0.84	1.42 ~ 0.80

● Professional HORSEMAN 10.5cm 1 : 3.5

(m)

	F 3.5	F 4	F 5.6	F 8	F 11	F 16	F 22	F 32
∞	∞ ~ 45.00	∞ ~ 39.40	∞ ~ 28.20	∞ ~ 19.70	∞ ~ 14.40	∞ ~ 9.84	∞ ~ 7.16	∞ ~ 4.92
100 m	∞ ~ 31.27	∞ ~ 28.49	∞ ~ 22.19	∞ ~ 16.68	∞ ~ 12.76	∞ ~ 9.19	∞ ~ 6.91	∞ ~ 4.90
50 m	∞ ~ 23.86	∞ ~ 22.21	∞ ~ 18.19	∞ ~ 14.33	∞ ~ 11.34	∞ ~ 8.44	∞ ~ 6.48	∞ ~ 4.70
30 m	88.73 ~ 18.13	123.11 ~ 17.17	∞ ~ 14.67	∞ ~ 12.06	∞ ~ 9.88	∞ ~ 7.61	∞ ~ 5.98	∞ ~ 4.43
20 m	35.65 ~ 13.90	40.16 ~ 13.30	67.64 ~ 11.80	∞ ~ 10.07	∞ ~ 8.51	∞ ~ 6.77	∞ ~ 5.46	∞ ~ 4.15
15 m	22.29 ~ 11.13	23.96 ~ 10.95	31.56 ~ 9.89	60.46 ~ 8.64	∞ ~ 7.47	∞ ~ 6.11	∞ ~ 5.02	∞ ~ 3.89
10 m	12.80 ~ 8.18	13.40 ~ 7.93	15.50 ~ 7.38	20.30 ~ 6.63	33.10 ~ 5.89	∞ ~ 4.96	∞ ~ 4.17	∞ ~ 3.30
8 m	9.65 ~ 6.84	9.95 ~ 6.70	11.03 ~ 6.30	13.20 ~ 5.77	17.52 ~ 5.24	39.20 ~ 4.54	∞ ~ 3.92	∞ ~ 3.21
5 m	5.63 ~ 4.50	5.73 ~ 4.44	6.08 ~ 4.25	6.70 ~ 3.99	7.68 ~ 3.71	10.10 ~ 3.32	16.50 ~ 2.94	783.38 ~ 2.48
3 m	3.21 ~ 2.81	3.25 ~ 2.79	3.36 ~ 2.71	3.54 ~ 2.60	3.80 ~ 2.48	4.32 ~ 2.30	5.16 ~ 2.11	7.68 ~ 1.86
2 m	2.09 ~ 1.92	2.11 ~ 1.90	2.15 ~ 1.87	2.23 ~ 1.82	2.33 ~ 1.76	2.51 ~ 1.66	2.78 ~ 1.56	3.37 ~ 1.42
1.5 m	1.55 ~ 1.45	1.56 ~ 1.45	1.59 ~ 1.42	1.62 ~ 1.39	1.68 ~ 1.36	1.77 ~ 1.30	1.90 ~ 1.24	2.16 ~ 1.15
1.2 m	1.22 ~ 1.18	1.23 ~ 1.18	1.24 ~ 1.16	1.26 ~ 1.15	1.28 ~ 1.13	1.32 ~ 1.10	1.38 ~ 1.07	1.48 ~ 1.02
1 m	1.02 ~ 0.98	1.03 ~ 0.98	1.04 ~ 0.97	1.05 ~ 0.95	1.08 ~ 0.94	1.11 ~ 0.96	1.16 ~ 0.88	1.26 ~ 0.83

● Super HORSEMAN 10.5cm 1 : 4.5

(m)

	F 4.5	F 5.6	F 8	F 11	F 16	F 22	F 32
∞	∞ ~ 35.90	∞ ~ 28.20	∞ ~ 19.70	∞ ~ 14.40	∞ ~ 9.84	∞ ~ 7.16	∞ ~ 4.94
100 m	∞ ~ 26.30	∞ ~ 22.30	∞ ~ 16.78	∞ ~ 12.83	∞ ~ 9.24	∞ ~ 6.94	∞ ~ 4.92
50 m	∞ ~ 20.75	∞ ~ 18.17	∞ ~ 14.31	∞ ~ 11.32	∞ ~ 8.42	∞ ~ 6.46	∞ ~ 4.68
30 m	202.69 ~ 16.29	∞ ~ 14.66	∞ ~ 12.05	∞ ~ 9.86	∞ ~ 7.59	∞ ~ 5.97	∞ ~ 4.42
20 m	45.97 ~ 12.83	67.57 ~ 11.81	∞ ~ 10.06	∞ ~ 8.50	∞ ~ 6.77	∞ ~ 5.45	∞ ~ 4.14
15 m	25.76 ~ 10.62	31.29 ~ 9.91	59.07 ~ 8.67	∞ ~ 7.50	∞ ~ 6.13	∞ ~ 5.04	∞ ~ 3.91
10 m	13.90 ~ 7.82	15.30 ~ 7.39	20.00 ~ 6.65	33.10 ~ 5.91	∞ ~ 5.03	∞ ~ 4.19	∞ ~ 3.30
8 m	10.24 ~ 6.58	11.00 ~ 6.31	13.12 ~ 5.79	17.34 ~ 5.25	37.86 ~ 4.55	∞ ~ 3.94	∞ ~ 3.22
5 m	5.78 ~ 4.41	6.07 ~ 4.25	6.55 ~ 3.99	7.56 ~ 3.71	9.23 ~ 3.32	16.50 ~ 3.05	515.54 ~ 2.48
3 m	3.25 ~ 2.78	3.34 ~ 2.71	3.53 ~ 2.60	3.77 ~ 2.48	4.26 ~ 2.30	5.01 ~ 2.11	7.70 ~ 1.87
2 m	2.10 ~ 1.91	2.15 ~ 1.88	2.23 ~ 1.88	2.33 ~ 1.79	2.48 ~ 1.69	2.72 ~ 1.63	3.30 ~ 1.48
1.5 m	1.55 ~ 1.45	1.56 ~ 1.42	1.60 ~ 1.39	1.66 ~ 1.38	1.70 ~ 1.33	1.89 ~ 1.27	2.13 ~ 1.15
1.2 m	1.23 ~ 1.17	1.24 ~ 1.16	1.26 ~ 1.15	1.28 ~ 1.13	1.32 ~ 1.10	1.37 ~ 1.07	1.47 ~ 1.02
1 m	1.02 ~ 0.98	1.04 ~ 0.97	1.05 ~ 0.95	1.08 ~ 0.94	1.09 ~ 0.93	1.14 ~ 0.88	1.20 ~ 0.85

● Super HORSEMAN 12.0cm 1 : 5.6

	F 5.6	F 8	F 1 1	F 1 6	F 2 2	F 3 2	F 4 5
∞	∞ ~ 36.66	∞ ~ 25.99	∞ ~ 18.44	∞ ~ 13.11	∞ ~ 9.34	∞ ~ 6.68	∞ ~ 4.79
100m	∞ ~ 26.90	∞ ~ 20.69	∞ ~ 15.61	∞ ~ 11.63	∞ ~ 8.57	∞ ~ 6.28	∞ ~ 4.59
50m	∞ ~ 21.24	∞ ~ 17.18	∞ ~ 13.54	∞ ~ 10.45	∞ ~ 7.92	∞ ~ 5.93	∞ ~ 4.40
30m	165.91 ~ 16.59	∞ ~ 14.02	∞ ~ 11.51	∞ ~ 9.20	∞ ~ 7.19	∞ ~ 5.52	∞ ~ 4.17
20m	43.74 ~ 13.02	86.88 ~ 11.39	∞ ~ 9.68	∞ ~ 8.01	∞ ~ 6.45	∞ ~ 5.07	∞ ~ 3.92
15m	25.19 ~ 10.72	35.19 ~ 9.60	81.11 ~ 8.36	∞ ~ 7.09	∞ ~ 5.84	∞ ~ 4.70	∞ ~ 3.70
10m	13.63 ~ 7.92	16.07 ~ 7.30	21.58 ~ 6.57	42.13 ~ 5.76	∞ ~ 4.92	∞ ~ 4.09	∞ ~ 3.32
8m	10.14 ~ 6.62	11.42 ~ 6.18	13.92 ~ 5.66	20.22 ~ 5.06	57.91 ~ 4.40	∞ ~ 3.73	∞ ~ 3.08
5m	5.73 ~ 4.44	6.11 ~ 4.24	6.74 ~ 4.00	7.90 ~ 3.69	10.49 ~ 3.34	19.82 ~ 2.95	∞ ~ 2.54
3m	3.24 ~ 2.80	3.35 ~ 2.72	3.52 ~ 2.62	3.79 ~ 2.50	4.27 ~ 2.34	5.22 ~ 2.15	7.71 ~ 1.93
2m	2.09 ~ 1.91	2.14 ~ 1.88	2.20 ~ 1.84	2.30 ~ 1.78	2.45 ~ 1.70	2.72 ~ 1.61	3.22 ~ 1.49
1.5m	1.55 ~ 1.45	1.57 ~ 1.44	1.60 ~ 1.41	1.65 ~ 1.38	1.72 ~ 1.34	1.84 ~ 1.28	2.03 ~ 1.21
1.2m	1.23 ~ 1.17	1.24 ~ 1.16	1.26 ~ 1.15	1.28 ~ 1.13	1.32 ~ 1.10	1.39 ~ 1.07	1.49 ~ 1.02
1m	1.02 ~ 0.98	1.03 ~ 0.98	1.04 ~ 0.97	1.05 ~ 0.95	1.08 ~ 0.94	1.11 ~ 0.91	1.17 ~ 0.88

● Super HORSEMAN 15.0cm 1 : 5.6

	F 5.6	F 8	F 1 1	F 1 6	F 2 2	F 3 2	F 4 5	(m)
∞	∞ ~ 58.40	∞ ~ 41.00	∞ ~ 29.90	∞ ~ 20.60	∞ ~ 15.10	∞ ~ 10.50	∞ ~ 7.53	
100m	∞ ~ 36.97	∞ ~ 29.15	∞ ~ 23.08	∞ ~ 17.17	∞ ~ 13.16	∞ ~ 9.52	∞ ~ 7.04	
50m	351.50 ~ 27.04	∞ ~ 22.63	∞ ~ 18.80	∞ ~ 14.70	∞ ~ 11.67	∞ ~ 8.72	∞ ~ 6.60	
30m	61.42 ~ 19.91	112.11 ~ 17.43	∞ ~ 15.08	∞ ~ 12.33	∞ ~ 10.14	∞ ~ 7.85	∞ ~ 6.09	
20m	30.23 ~ 14.98	38.80 ~ 13.54	60.26 ~ 12.09	848.27 ~ 10.27	∞ ~ 8.71	∞ ~ 6.98	∞ ~ 5.56	
15m	20.05 ~ 12.01	23.46 ~ 11.07	29.84 ~ 10.09	54.89 ~ 8.80	∞ ~ 7.64	∞ ~ 6.28	∞ ~ 5.12	
10m	12.00 ~ 8.59	13.10 ~ 8.11	14.80 ~ 7.58	19.10 ~ 6.84	29.40 ~ 6.12	317.21 ~ 5.23	∞ ~ 4.41	
8m	9.20 ~ 7.08	9.84 ~ 6.76	10.78 ~ 6.39	12.84 ~ 5.86	16.71 ~ 5.33	34.12 ~ 4.72	∞ ~ 4.00	
5m	5.34 ~ 4.64	5.63 ~ 4.50	5.92 ~ 4.34	6.47 ~ 4.10	7.29 ~ 3.84	9.28 ~ 3.49	14.60 ~ 3.12	
3m	3.14 ~ 2.87	3.20 ~ 2.82	3.29 ~ 2.76	3.43 ~ 2.67	3.64 ~ 2.57	4.04 ~ 2.41	4.74 ~ 2.24	
2m	2.05 ~ 1.95	2.08 ~ 1.93	2.11 ~ 1.90	2.17 ~ 1.86	2.24 ~ 1.82	2.37 ~ 1.75	2.57 ~ 1.66	
1.5m	1.53 ~ 1.47	1.54 ~ 1.46	1.55 ~ 1.45	1.58 ~ 1.43	1.62 ~ 1.40	1.68 ~ 1.37	1.76 ~ 1.32	
1.2m	1.22 ~ 1.18	1.22 ~ 1.18	1.23 ~ 1.17	1.25 ~ 1.16	1.27 ~ 1.14	1.30 ~ 1.12	1.34 ~ 1.09	
1m	1.01 ~ 0.99	1.01 ~ 0.99	1.02 ~ 0.98	1.03 ~ 0.98	1.04 ~ 0.97	1.06 ~ 0.95	1.08 ~ 0.94	

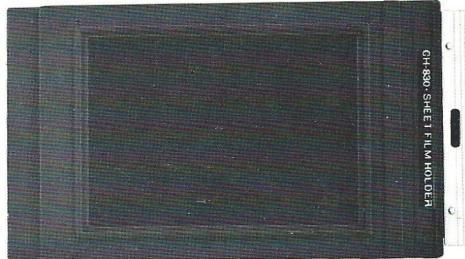
● HORSEMAN 18.0cm 1 : 5.6

	F 5.6	F 8	F 1 1	F 1 6	F 2 2	F 3 2	F 4 5	(m)
∞	∞ ~ 84.20	∞ ~ 59.05	∞ ~ 43.00	∞ ~ 29.71	∞ ~ 21.71	∞ ~ 15.04	∞ ~ 10.81	
100m	∞ ~ 45.81	∞ ~ 37.22	∞ ~ 30.17	∞ ~ 22.97	∞ ~ 17.88	∞ ~ 13.11	∞ ~ 9.77	
50m	122.94 ~ 31.48	331.52 ~ 27.20	∞ ~ 23.35	∞ ~ 18.75	∞ ~ 15.24	∞ ~ 11.65	∞ ~ 8.96	
30m	46.41 ~ 22.21	60.75 ~ 20.00	99.22 ~ 17.80	∞ ~ 15.05	∞ ~ 12.72	∞ ~ 10.13	∞ ~ 8.04	
20m	26.10 ~ 16.24	30.06 ~ 15.03	37.12 ~ 13.76	61.27 ~ 12.07	288.28 ~ 10.53	∞ ~ 8.71	∞ ~ 7.13	
15m	18.16 ~ 12.80	19.97 ~ 12.04	22.83 ~ 11.22	30.06 ~ 10.08	49.99 ~ 8.99	∞ ~ 7.64	∞ ~ 6.40	
10m	11.20 ~ 8.99	11.90 ~ 8.61	12.90 ~ 8.19	14.80 ~ 7.58	18.30 ~ 6.96	29.80 ~ 6.13	182.71 ~ 5.32	
8m	8.79 ~ 7.35	9.18 ~ 7.10	9.72 ~ 6.81	10.80 ~ 6.39	12.46 ~ 5.95	16.85 ~ 5.34	31.54 ~ 4.72	
5m	5.29 ~ 4.75	5.42 ~ 4.65	5.60 ~ 4.53	5.92 ~ 4.34	6.37 ~ 4.14	7.30 ~ 3.85	9.06 ~ 3.53	
3m	3.09 ~ 2.91	3.13 ~ 2.88	3.19 ~ 2.84	3.28 ~ 2.28	3.41 ~ 2.69	3.63 ~ 2.57	3.99 ~ 2.44	
2m	2.04 ~ 1.97	2.05 ~ 1.95	2.07 ~ 1.93	2.11 ~ 1.91	2.15 ~ 1.87	2.23 ~ 1.82	2.35 ~ 1.76	
1.5m	1.52 ~ 1.48	1.53 ~ 1.48	1.54 ~ 1.47	1.55 ~ 1.45	1.57 ~ 1.44	1.61 ~ 1.41	1.66 ~ 1.38	
1.2m	1.21 ~ 1.19	1.21 ~ 1.19	1.22 ~ 1.18	1.23 ~ 1.17	1.24 ~ 1.16	1.26 ~ 1.15	1.29 ~ 1.13	
1m	1.01 ~ 0.99	1.01 ~ 0.99	1.01 ~ 0.99	1.01 ~ 0.98	1.02 ~ 0.98	1.03 ~ 0.97	1.04 ~ 0.96	

The following Holders are prepared for the HORSEMAN 985 and they are available to the every kinds of the HORSEMAN cameras, not only Model 985:

\* **Sheet film Holder**

It is for 6x9cm. cut film, and glass plate, and single exposure furthermore is designed for preventing from double exposure.



\* **HORSEMAN Roll film Holder Model 1;**

It is for 6x9cm. size and takes 8 exposures on the No.120 Roll film, its actual picture size 5.6 x 8.2cm.

It is operated by Winding-lever under ratcheting system and transferred the film smoothly and precisely with automatic film stop and film counter.

Automatic re-setting of film counter number is done by opening the back cover of the holder. Its name is indicated in white.



\* **HORSEMAN Roll film Holder Model 2**

It is for 6x7cm. size and takes 10 exposures on the No.120 Roll film, its actual picture size is 5.6 x 7.0cm.

Its mechanism and operation are almost similar to those of Model 1. Name is indicated in red.

\* **Remarks:**

Speedgraphic's 2-1/4" x 3-1/4" Sheet film Holder, Changing Back and 6x7cm.

Roll film Holder are available on the HORSEMAN 985 and other earlier models.

\* **Flatness of the film surface**

of the all types of HORSEMAN film Holders has been considered carefully and manufactured, and which is very excellent.



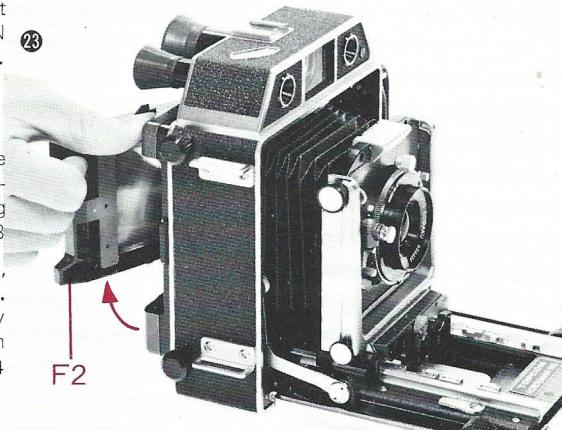
# 11

## Attachment and Detachment of the Film Holder.

Attachment and Detachment of the Sheet film Holder, Changing Back, and HORSEMAN exposure computer are done in the same way. 23

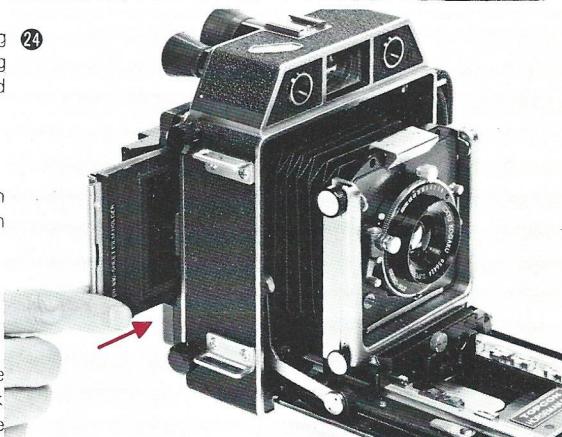
Lift up the Tab of the Focusing Screen Frame (F2) and then insert a Sheet film Holder between the Focusing Screen Frame and Swing Back Frame (E1). photo ..... 23

The sheet film Holder should be inserted in, with the safety slide facing to the lens gently. Focusing Screen Frame (F2) will give the way to insert the holder, maintaining the holder in parallel. photo ..... 24

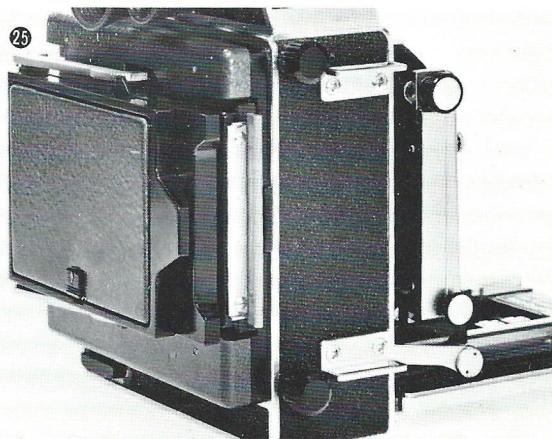


After meeting some resistance on its inserting way the holder will stop at the end, falling down into a spot. The holder is attached completely. 24

Detachment of the Sheet film Holder. Lift up the Tap of the Focusing Screen Frame (F2) and then Draw out the Sheet film Holder.



The following precaution is necessary; Maintain up pressure on the Focusing Frame so it does not strike strongly the camera back when the Sheet film holder is about to leave from the back. 25



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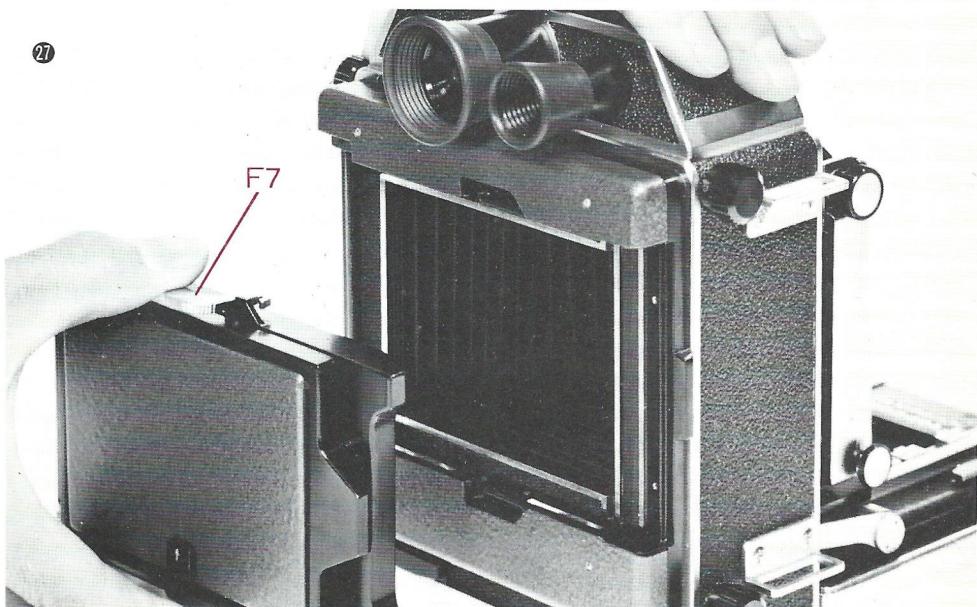
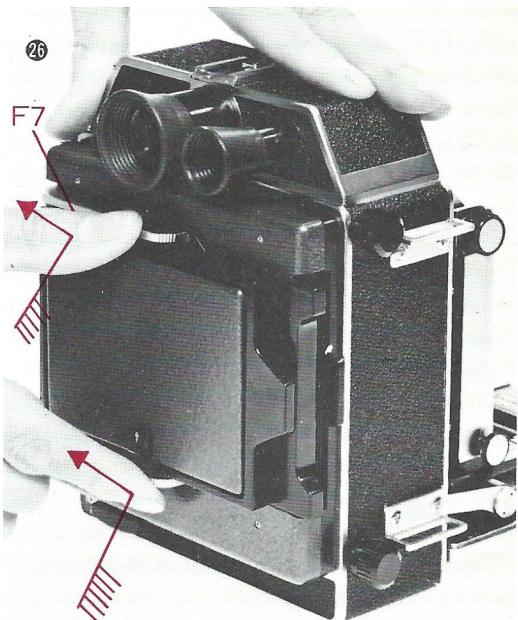
#### \* Attachment of the ROLL Film Holder

In order to attach the roll film Holder on the Camera body firstly the Focusing Screen Frame (F2) should be detached.

Detachment of the Focusing Screen Frame:

- 1) Press down the Retaining Arms (F7) of the Focusing Screen Frame, and a catch between the Focusing Screen Frame and Camera body will be released, so they become free. photo.. 26  
The Retaining Arms (F7) are on upper and lower sides of the Frame as the picture shows.
- 2) Maintaining the Retaining Arms pressed down, draw or thrust it to the left (facing to the Back), and pick up the Frame after the Arms are completely free from its catch.

photo .... 27



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\* **Attachment of the Roll Film Holder:**

Put the Roll film Holder on the Back of Camera Body as the picture shows,

photo ..... 28 29

Lock the Holder by the Accessory Catch (E2) which are on the upper and lower sides of the camera back. The Holder will be completely and firmly attached on the camera body.

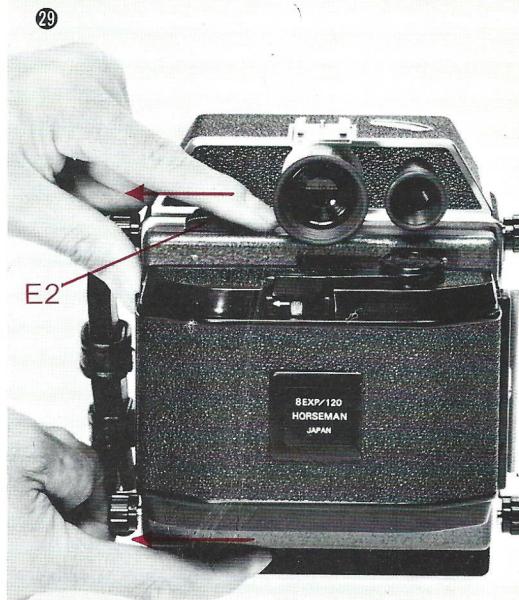
\* **Detachment of the Roll Film Holder:**

Release the catch of the Roll film Holder by the upper and lower sides Accessory Catch (E2), proceeding by reversing the order of attachment.

\* **Re-attachment of the Focusing Screen Frame:**

Put the Focusing Screen Frame on the camera back.

Maintaining the Retaining Arms pressed down, thrust the Focusing Screen Frame slightly to the right; the Focusing Screen Frame is now locked in position.



# 12

## Camera Movements

In general cameras, the light which passes through the center of lens axis is vertical to the film picture and it passes the center of the film picture. This is the basical condition of the camera.

All the cameras in which the rangefinder is built-in the body should be designed from stand-point of the above mentioned view.

However, when the picture is taken at an angle or distance different from-normal viewing, the result of the picture is often different from our human feeling which is gained by actual seeing and recognition. Also within a permitted range of apertures sometimes one can not make the depth of field larger by normal focusing. In these matters one can improve a picture by utilizing the moveable parts of the camera, generally known as "camera movements".

When using camera movements, the conditions are different than fixed lens cameras.

Basically, the back of the camera is brought into a parallel position with the subject. The front of the camera is then made parallel with the back to assure overall sharpness. Other possibilities are increasing depth of focus or intentional distortion. These subjects require more detail than can be offered in an instruction booklet. We suggest you contact the seller of your camera for a listing of current books on Corrective Photography.

The HORSEMAN Camera has all possible adjustments required for corrective photography. These are:

A. Rising front	C. Tilt front	E. Bed down
B. Cross front	D. Swing front	F. Tilt back

To summarize some of the possibilities of these adjustments:

### Distortion Correction

Camera higher or lower than subject

Align camera back with vertical lines of subject using swing front and swing back. Align front of camera with back to insure overall sharpness.

Camera at horizontal angle to subject

Align camera front and back as above with horizontal lines of subject.

Elimination of foreground detail.

Use rising front of camera to position subject on ground glass, thereby keeping camera level.

**Increasing depth of field** — Swing camera back towards far objects as observed on groundglass swing and away from rear objects. This permits a selective focus carrying maximum sharpness from near to far.

The effects of camera adjustments can be noted on the groundglass screen. Always focus on the groundglass when using camera movements.

The object of camera swings and tilts is to secure a photograph that corresponds to the undistorted view "seen" by the eye. Whenever the camera is not exactly level and parallel with the subject, some distortion will result. Therefore, the movements of front and rear standards permit alignment of lens and film with subject even when the camera is in a high or low angle.

For the use of camera movements, there are movable parts on the HORSEMAN 985, namely Front movements (Bed Down, Rising, Tilt, Swing and Lateral Cross) and the Back Movements (Tilt and Swing).

#### \* **Front Movements**

##### \* **Bed Down**

When the camera is opened, the bed automatically comes to rest at a 90°(right) angle to the body.

To drop the Bed;

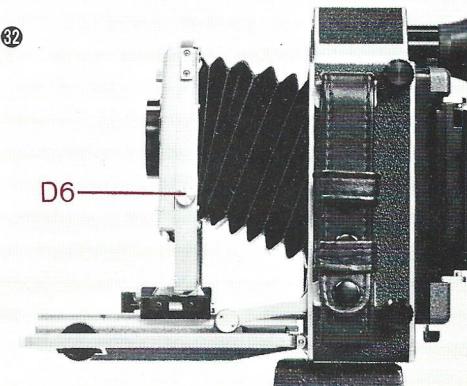
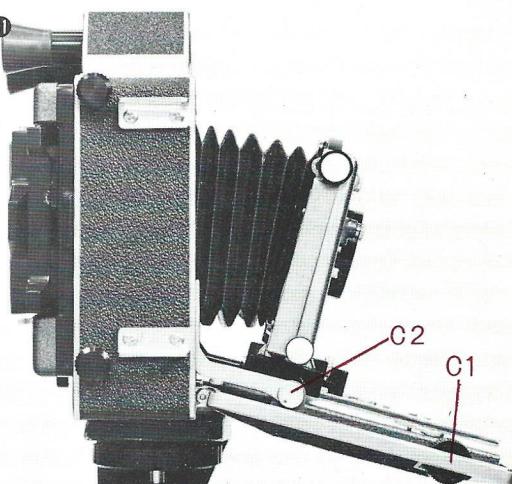
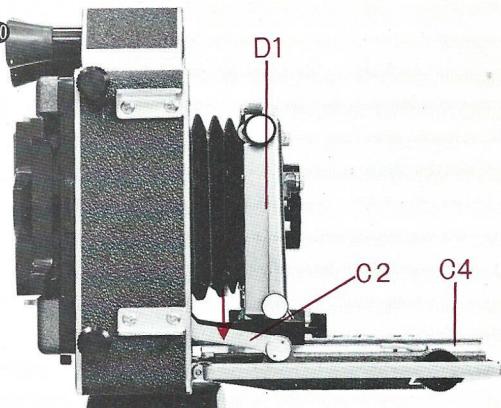
The lens standard (D1) must be on the focusing track (C4), before the Bed is dropped.

Hold the camera, with both hands, its back facing you, with a thumb on each bed brace (C2). With both forefingers on the bed, push the bed braces (C2) with the thumbs, at the same time pressing the bed with the forefingers.

The Bed braces will extend to their second locking position, and the Bed will drop additional 15°, for total drop of 105°.

To return the Bed to its 90 angle position: Hold the camera with both hands, its back facing you, with your thumbs on the bed braces.

Push down on the Bed braces and pull up the Bed slightly until the braces snap into their first locking position.



##### \* **Rising**

Loosen the Retaining Screw of Rising (D6) that is prepared on the left side (camera back facing you) of the lens Standard.

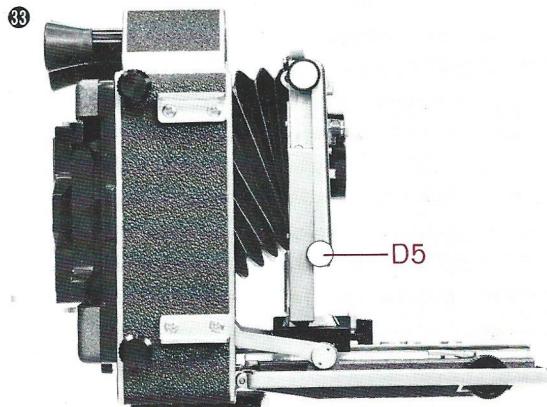
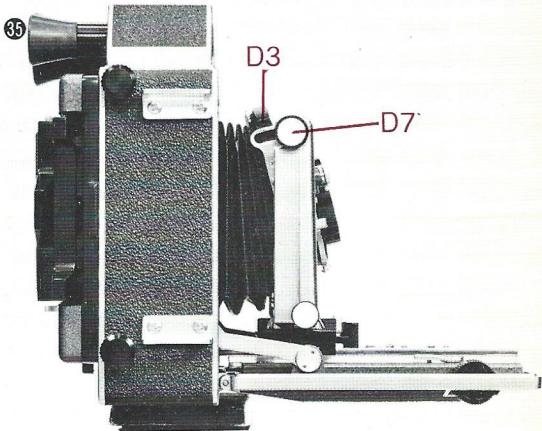
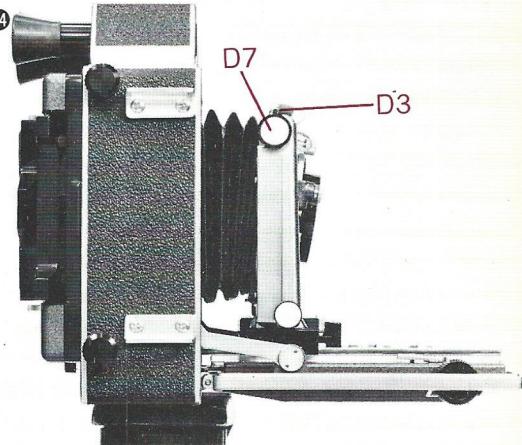
Turn the Rising Front control knob (D5) that is located on the right side (camera back facing you) of the lens Standard. Stop and tighten the Retaining Screw of Rising (D6).

---

The lensboard rises up to Max. 28mm, when the Rising Front Control knob is rotated. This action moves the perpendicular surface of the optical axis vertically moving the image with it.

\* **Tilt**

Loosen the Tilt Front Locking knob(D7). Move the Lens Panel Frame (D3) to the desired position (forwards or backwards). Tighten the Tilt Front Locking knob (D7) and it will remain in the tilted position you have chosen.  
At full tilt back, the lensboard can be tilted a maximum of  $15^{\circ}$ , tilted forwards maximum of 10. photo ...34, 35.



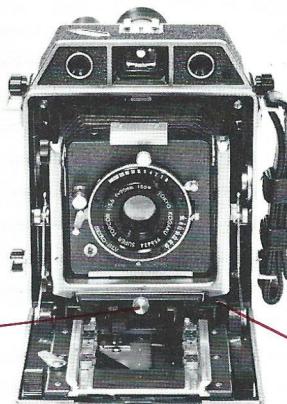
### Swing

Push down on the Swing Front release catch (D9), and the lens standard can be now swung left or right 15° each way.

When the lens standard has been swung to the position desired, remove your finger pressure, and the lens standard will hold in position at zero position, the lens standard is click stopped.

photo ..... 36.37

36



### Cross

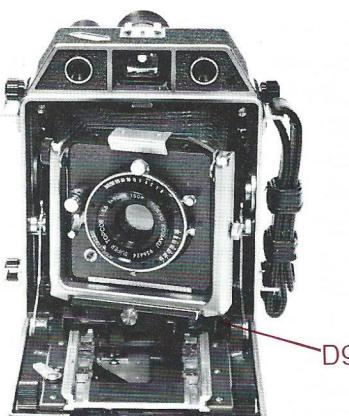
Loosen the Cross Front Locking knob (D10) which is prepared at the center of the lower part of the Lens Standard.

Press (Thrust) the Lens standard to left or right laterally.

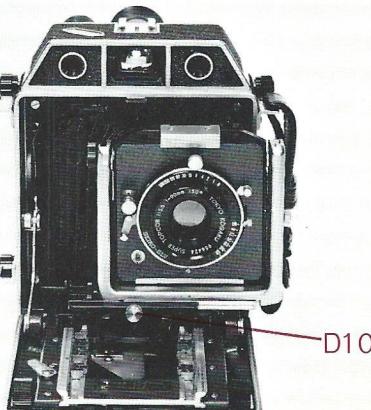
Stop and tighten the Cross Front Locking knob (D10) when the lens standard has been crossed to the position desired.

photo ..... 36.38

37



38



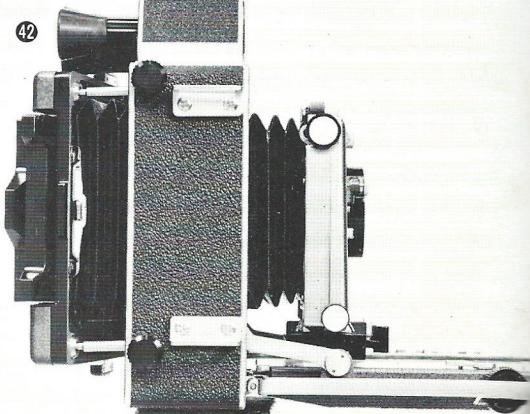
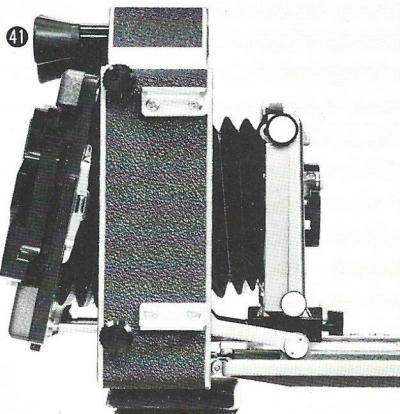
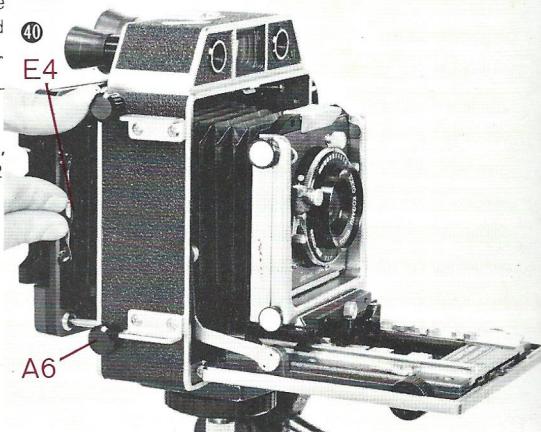
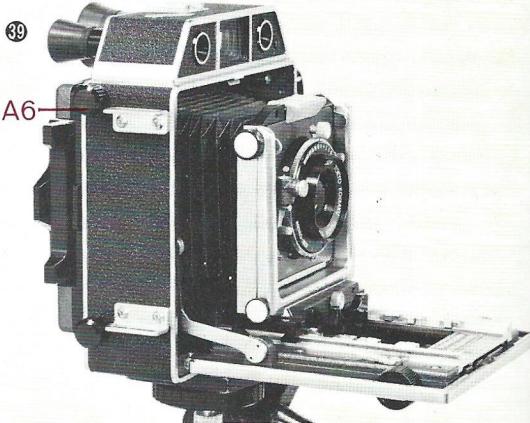
\* **Rear Camera Movements mechanism.**

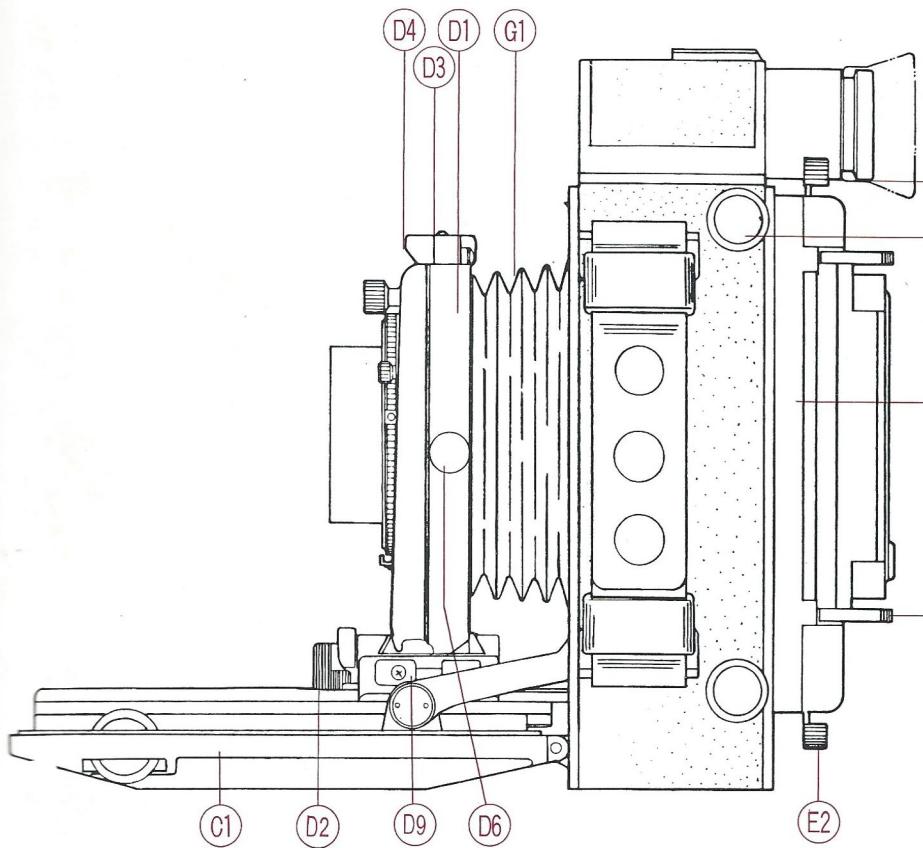
Loosen the four (4) Swing Back Locking knobs (A6) on the two sides of the camera body. photo ..... 39

With your palm across the back of camera. Place your thumb on the Frame Tab and Pull out the tab. one side of the entire back will come free. Repeat on the other side. The back is now supported by the four ball head bolts and can be extend, swung or tilted to any desired position, using groundglass focusing when you have reached the desired position.

Tighten the four ball head lock bolts (A6). When the back is moved in any way, the original fixed film plane is changed and the lens is not coupled to the rangefinder. All focusing must be done with ground-glass.

Maximum back extension is 23mm. swing, 10 tilt 11 up/down photo ..... 41,42

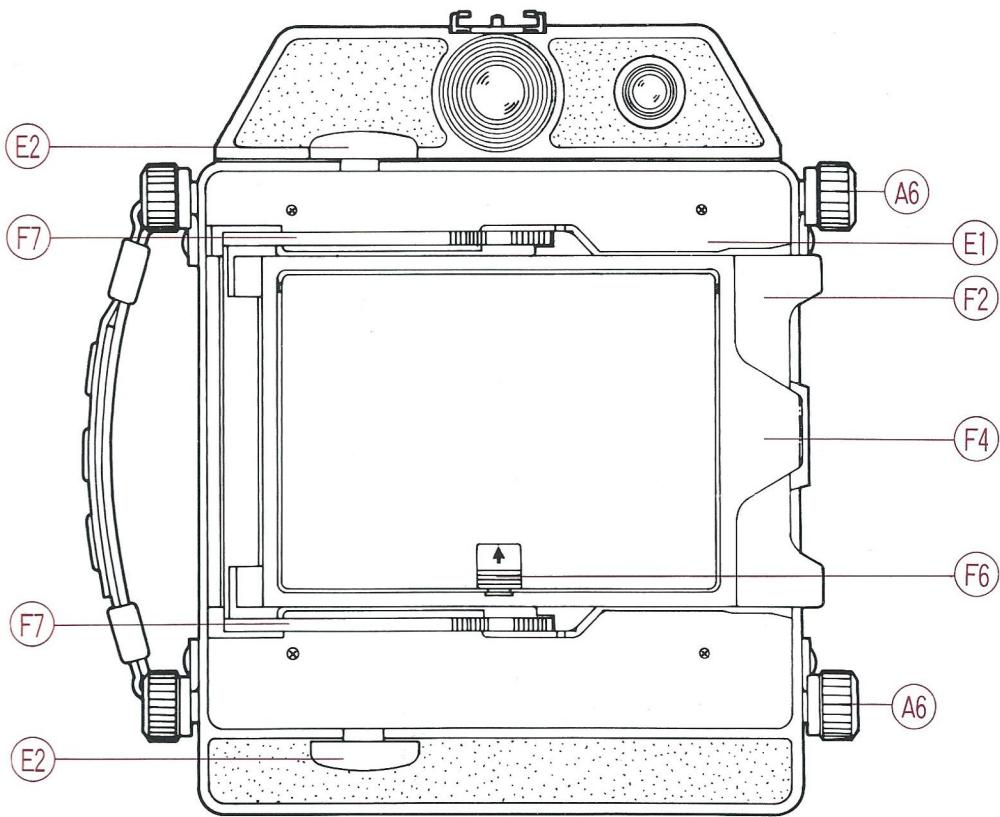




#### D. LENS STANDARD

- (D1) Lens Standard
- (D2) Pull Out Grips
- (D3) Lens Panel Frame
- (D4) Lens Panel Retainer with Safety Lock
- (D5) Rising Front Control Knob
- (D6) Rising Locking Knob

- (D7) Tilt Front Locking Knob
- (D8) Tilt Front Vertical Locater
- (D9) Swing Front Release
- (D10) Cross Front Locking Knob
- (D11) Lens Panel Spring Clip



#### E. CAMERA BACK

- (E1) Swing Back Plate
- (E2) Accessory Catch
- (E3) Swing Back Limited Screw
- (E4) Swing Back Plate Spring Hook

#### F. GROUNDGLASS

- (F1) Groundglass w/Fresnel Glass
- (F2) Focusing Screen Frame
- (F3) Focusing Shade
- (F4) Focusing Shade Frame
- (F5) Focusing Shade Snap Button
- (F6) Focusing Shade Closure catch
- (F7) Retaining Arms for Focusing Screen Frame

#### G. BELLOWS

- (G1) Bellows



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